JUN 8 1929

AMERICAN JOURNAL of PHARMACY

SINCE 1825

A Record of the Progress of Pharmacy and the Allied Sciences

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Vol. 101 MAY, 1929 No. 5

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Price $3.00 per Annum in Advance Foreign Postage, 25 Cents Extra

Single Numbers, 30 Cents. Back Numbers, 50 Cents

Entered as Second-Class Matter at the Post Office at Philadelphia, Pa., Under the Act of March 3, 1879

Acceptance for Mailing at Special Rate of Postage Provided for in Section 1103, Act of October 3, 1917. Authorized February 15, 1920

PUBLISHED MONTHLY BY THE

Philadelphia College of Pharmacy and Science

43d Street and Kingsessing Avenue, West Philadelphia, Pa.

American Journal of Pharmacy

ESTABLISHED IN 1825

Four preliminary numbers were published at different times until in 1829, when the publication of the regular volumes began. Since then the publication has been uninterrupted. During the period from 1829 to 1852 four numbers were published annually, except in 1847, when five numbers were published. From 1853 to 1870 six numbers were published annually. Since this time twelve numbers have been published annually.

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Covers with Titles		2 pp.	4 pp.	8 pp.	16 pp.
25 copies	$1.75	25 copies	$2.25	$3.75	$ 7.75	$ 9.00
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THE AMERICAN
JOURNAL OF PHARMACY

VOL. 101 MAY, 1929 NO. 5

EDITORIAL

THE FIRST BALANCE

SOMEWHERE IN HIS metamorphic songs Ovid tells of the invention of the saw. I can well recollect the little schoolhouse on a heathered hill where many years ago a very serious-minded Latin teacher literally dragged me through what then seemed mire and mud—for I was none too avid for the Latin of Ovid in spite of his homely tales.

Anyway, if memory serves me well, that garrulous old Roman writer describes, with painful detail, the Daedalic origin of the simple carpenter's saw. And, though as a boy, I could but briefly enthuse, if at all, over the invention of so simple a device as a saw—a thing that anyone might invent—I have since many a time wondered and wondered who might have been responsible for the thousand homely devices which today are so commonplace and so belonging to our very existence.

Indeed most of these humble blessings we accept with about the same degree of indifference and nonchalance as the sod accepts the dew and the cod his sodium chloride.

Whose monstrous mind, for instance, first conceived the fork —the comb—the button—and its hook—the kettle—the cup—the mortar—the pestle—the pen—the pin—the rake and the hoe—the hatchet—the tack—the clothes-pin—the scissors—and the thousand other unsung but indispensable blessings?

Who invented the balance?

Elsewhere in this issue is printed a most interesting and instructive article on weights and measures, written by Professor Nichols.

Yet, so complete as it is, it does not record the name of that benefactor of posterity out of whose fertile mind came the first idea of the simple balance. That basic balance, the single beam, equal arm—parent of all the balances, must have had an early origin—so early that time has completely forgotten it.

Invention, of course, rarely comes full blown, like Jove begat Minerva—but rather like the slow growth of an oak—and many the mind that contributes to any single invention, no matter who gains the conceiving distinction.

Early barter and trade between individuals or tribes must have demanded some means of appraisal of bulk and of weight, and the natural primitive way to compare weights was by means of the hands and arms, a method still pursued in the untutored lands. And what better example is there of the fundamental, single beam, equal arm balance, than a person standing erect and comparing two articles, weight for weight, by counterpoising them in his hands?

There is your first balance—living and unreliable! It was not a far step from this to some available model of the biased human balance—for even in those primitive days it must have been recognized that fallibility was more belonging to the animate rather than to the inanimate. And so with a rigid stick for the beam—a few rawhide thongs and a pair of similar sea shells (hence *scales*) some Piltdown or Cro-Magnon Edison constructed the first inanimate balance.

From that to the modern weighing devices, some delicate enough to be moved by the whispers of ghosts and others comprehensive enough to evaluate the weight of a planet—from those crude sea shells—to the weighing wonders of today is a long, long way—but it marks the certain progress of the Lord's pet creation—and it bespeaks the living evolution which has carried man from his cave-existence to his current civilization—and which is destined to carry him still on—and on—to the unthinkable eminences.

IVOR GRIFFITH.

THE COSMETIC URGE AGAIN

THE VIVID PRESENTATION of the facts about "Paint and Powder" in Professor Griffith's lecture in the April issue of this Journal, renders opportune a summary of information recently published by the Health Department of New Hampshire, through the department's monthly bulletin, "Health." The analyses were first published in the report of the State Board of Health for 1927-28.

Legislation for the control of cosmetics, especially preparations for the hair and for reduction of weight, has been sought actively of late, but has met with strenuous opposition. This is in large part due to the control of the newspapers, since the profits on such preparations are large both to the manufacturer and the dealer. The newspapers are further held back in many cases by a specific contract of which the following is a common form:

> "Should there be any rulings or laws enacted whereby in our opinion the advertisers cannot profitably advertise or sell their product, we reserve the right to cancel this contract."

It is worth noting that the insertion of this clause is evidence that the maker of the article is aware that its composition is not in the line of strictly honest goods. Those who make first-class goods that are known to serve the purpose for which they are advertised require no such clause.

The New Hampshire report includes seventy-seven articles, mostly for the hair, but skin treatment is largely represented and some reducing preparations. The old lead acetate-sulphur mixture was frequently encountered, often with most misleading claims. The following is an instance:

> "A secret formula discovered during experiments, seeking a scalp food and tonic to stimulate roots and color (etc.). Not a hair dye. Harmless, pleasant, effective. Harmless as rain water."

Really one may ask what difference is there between a man or group of men who will put out such false claims and the bandits who figure so prominently in our cities. If the case cited was isolated or rare there might be no great protest, but the New Hampshire investi-

gations have shown many similar frauds. One incident is worth quoting in full on account of the disposition of it. The label read:

> "A secret formula for restoring gray hair to original color. Positively it is not a dye but a scalp treatment, which causes the roots of the hair to function normally, thereby restoring the hair to its original color and vitality. Price, 8 oz. bottle, $3."

This proved to be a lead-sulphur mixture and as the false claims brought it within the scope of the State law, the entire wholesale stock of a druggist in one of the cities, amounting to 4000 bottles, with a nominal retail value of $14,280, was libeled for seizure, and no claimant appearing was destroyed by order of the Court.

In some cases preparations for the hair contained paraphenylene diamine (1-4 diaminobenzene). This compound is forbidden in several foreign countries, and should, at least, not be used without notice. Copper and silver salts mixed with a reducing agent such as pyrogallol, are also found, and sometimes advertised as "free from all poisonous substances." Arsenical preparations are also on the market. One preparation advertised as a "vegetable hair coloring" contained 5.02 per cent. of copper.

An important point about these articles (and many others appealing to vanity or offered for self-medication) is the enormous profits that accrue to maker, jobber and retailer. This is well illustrated by a preparation advertised as a "face balm," sold at retail at $5 per 8-ounce bottle. It was found to be perfumed water with calcium carbonate in suspension. Truly, there must be a strong "cosmetic urge" to lead the public to be tricked by such frauds.

HENRY LEFFMANN.

ORIGINAL ARTICLES

HOW MUCH DO YOU WEIGH?*

By Adley B. Nichols, Ph. G., Phar. D., B. Sc.

Assistant Professor, Operative Pharmacy, Philadelphia College of Pharmacy and Science

FEW QUESTIONS CONCERN the human race more directly and universally than the subject of weights and measures. As a matter of fact this question is taken for granted. It is one of daily routine, for we are all either buyers or sellers and are therefore involved in its meshes.

SCOPE

Weights and measures are fundamental necessities of commerce, industry and science. Measurement is required in the exploration of lands and waterways, in the construction of roads, bridges, railroads, buildings and other engineering works, in the manufacture of foods, in the purchase and sale of materials, in the preparation of compounds of every description. Weights and measures are essential to all barter of goods, whether it be the "heap" or "pile" of ancient times or the fractions of a cent quoted on the cotton or wool market. They are required alike in all construction work, whether it be the rule of thumb procedure or the precision and accuracy of the millionth of an inch in optical work.

Adley B. Nichols, B. Sc., Phar. D.

The pharmacist with his weights and measures compounds prescriptions which mean health and life to the sick. Weights and measures are used to determine the essential proportions in analyses of compounds, and upon precision rests the ability to reproduce these results. Likewise the manufacturer must accurately weigh, measure and test his materials to secure perfect construction. Surveying and navigation would be very primitive were it not for the rigorous measurements of base lines, the accurate determination of angles,

*One of a Series of Popular Science Lectures delivered at the Philadelphia College of Pharmacy and Science, 1927-1928.

precise leveling, even to the delicate determination of latitude. Weights and measures are essential in the development and statement of industrial and scientific facts of all kinds and the modern growth of science can easily be laid to the development of precision, our life itself fitting into measured schedules of time and place. The carefully measured curves of every tool in industry are alive with the treasured skill of a race of craftsmen. Measurement is a miracle worker. We give a measured curve to glass to match a measured defect of the eye and thus restore sight to the aged and perfect the vision of youth. With a series of lenses the laboratory clinician measures the life stream and upon his findings one's time upon this earth is subsequently lengthened.

Feeding the race, a primary necessity, creates countless recipes, which set to measure the skill of the cook and thus make reproducible a host of delectable dishes. The success of every feast depends upon the measurements which assure perfection in the culinary masterpieces. We go further and measure calories and nitrogen for bodily energy and repair and thus we are able to feed scientifically.

WEIGHTS AND MEASURES OF PRIMITIVE MAN

To trace weights and measures to their origin let us go back to primitive man and try to consider how he adapted himself to his surroundings. Here we would probably find measurement closely linked with number, as he grouped items together, and once grouped, he would unconsciously compare the various pieces, using one of the group as a unit. This in turn led to the necessity of fixing a permanent standard by which he could make comparisons at all times. Likewise, if it took a certain number of days to make a journey, the distance covered in one day came to be looked upon as a unit of travel or distance. The distance a man could run without stopping became another unit, the distance covered by a step at walking pace another.

For measuring still smaller distances the primitive man would take the various members of the body as units of measure. The length of the foot, the breadth of the hand, the width of a finger, the span of the extended fingers, the length of the forearm or the distance between his finger tips with the arms outstretched. These were natural units by which he could express himself and even today we find them still referred to in the foot, the palm, the digit, the span, the cubit and the fathom. All of these distances figured in the early system of measures, and in fact there was a great diversity in the

measures of early civilization due to the fact that only the convenience of the individual had to be considered. However when several persons were concerned in the comparison of the size of an object or some other kind of measurement, it was necessary to conform to the convenience of the group rather than that of the individual, and with the development of trade there was also added the idea of equity. If a pace or a span was a convenient unit for a number of individuals, it would soon become necessary to specify the class of individuals or better yet the single individual whose pace or span was to be the standard, for naturally the pace of a man only four feet tall would not compare favorably with one who was six feet tall. Thus by common consent one of the group would be selected to provide the proper units, and as a matter of convenience to all, these units were probably marked off on some surface where they could be available for all as standards of comparison. Very frequently the one selected to provide these standard units was the chieftain or ruler of the tribe and as a matter of fact many of the units in use today date back to that practice. As late as the time of Henry I the length of the English yard was fixed by the length of the king's arm and when thrones changed hands new units of measurements were required to conform to the new arm.

EARLY BARTERING

It probably did not take primitive man long to discover that if he gathered an extra supply of food on one day he would not need to worry about it on the next and before long he probably acquired the habit of accumulating large quantities of supplies. His neighbor would do likewise but probably with another line of material and so they began to barter, each exchanging some of his supplies for those of his neighbor. Here standards were required and eventually the "bunch" or the "pile" was replaced with units of more definite value. The earliest records seem to show that the first basis of exchange was the ox or cow, which in turn soon found its equivalent in a certain amount of gold. Gold was a universal metal although somewhat scarce and consequently could be given definite value in terms of cows or oxen. This would involve some crude method of capacity as perhaps a goose quill for measuring powdered gold and finally the use of a primitive balance in which seeds were used as weights. The common seed for this purpose was the Rati or Gunga (wild licorice) seed. Because of their uniformity in size and their permanence,

these seeds were well adapted to this purpose. They were followed by barley and wheat and this again brings us up to our present period and English weights, for according to the statute of Henry III in 1266, the English penny should weigh "thirty-two grains of wheat well dried and gathered out of the middle of the ear." The jewelers unit of weight, the carat, is another example of a standard developed from a similar source as it is taken from the Arab "carob" or bean.

Early weighing was apparently confined to the weighing of gold, and later silver and copper, in trade only, until the 17th dynasty or about 1200 B. C., and it was not until the seventh century B. C. that coined money was used. That this weighing of metals by the balance was universal we see in the first book of the Bible, where in the story of Abraham's dealing with the sons of Heth "Abraham weighed four hundred shekels of silver" with which to pay for his burial place. This incidentally is the first reference to weighing in written history. As a natural result of such weighing, units of stone or metal were made, based on the weights of seeds.

DEVELOPMENT OF WEIGHTS AND MEASURES

Capacity measures were gradually developed probably beginning with the capacity of the cupped hands or that of an egg shell or gourd, or a cylinder shaped from a piece of bamboo. These were followed by jars and containers fashioned from clay, and of a convenient size to meet the daily needs in carrying water, grain and other similar necessities. Eventually some of these articles were accepted as units or standards of capacity and frequently a particular vessel was used only as a unit of measure for a particular seed or fruit. Many examples of this type have been unearthed in Egyptian ruins in the form of glass vases or receptacles on each of which is imprinted the amount or weight of content and also the name of the contents, probably not to show what was in them but to show for what kind of seed the vessel was a true measure. These measures and stamps date as far back as 600 A. D.

BODY UNITS OF MEASUREMENT

As before stated the earliest measures of length were based upon the various units of the body, the fathom of six feet, the cubit or one-quarter fathom, nineteen to twenty inches, the span or one-half cubit of nine inches, the palm or four fingers equal to one-third the span or one-sixth cubit or three inches, and the digit, the middle finger breadth of three-quarters of an inch, one-twelfth span or one twenty-fourth of the

cubit. From this division of the cubit into six palms, the span into twelve digits, came the division of the day into watches and hours, the years into months, etc., in other words, our duodecimalism.

THE CUBITS AND THEIR DEVELOPMENT

Like other units, the cubit was at first an arbitrary standard, but as time went on it became necessary to fix its value by law and so by about the fortieth century B. C. it had definitely been established as a length equal to 18.24 inches. There seems to be no doubt today but that the cubit of Egypt was obtained through the measurement of the earth, for though there are no written records available, one of the greatest and oldest monuments in the world shows this, and establishes the fact that early measures were not hit or miss standards but were apparently developed through scientific means. The monument referred to is the great pyramid, for its base is 500 cubits long on each side and this is found to be exactly half a meridian or nautical mile or 500 Egyptian fathoms in perimeter.

A vessel representing a cubic span or foot gave rise to another popular unit, the talent, used for weight and also for capacity. A larger container capable of holding a talent of grain, wheat for instance, became another unit, the bushel. This was followed by another subdivision of the talent, the pound, a portion of this in turn being used as the standard of weight for coins. Then a number of coins eventually developed the ounce and again 12 or 16 ounces became a pound.

All of these units passed to and fro from one people to another and were mixed and replaced one with another in their trading and in the changing of hands as one tribe or nation conquered or triumphed over the other. This resulted in there being many different values for the same stated unit, not much different as a matter of fact, however, from the situation under which we labor today.

BIBLE UNITS

Among the many interesting units of weight and measure those mentioned in the Bible are typical of the ones in use in general throughout the early period covered by the Egyptian, Roman, Babylonian and Grecian empires. Among these are the following:

Units of length

The body units already mentioned
The *stadium* of 400 cubits (⅛ mile)
The *mile* of 10 stadia (⅕ more than an English mile)

Units of measure

The *log*—smallest liquid measure—(¾ pint)
The *cab*—⅙ seah (3½ pints)
The *omer*—(dry measure) 6¼ pints
The *hin*—1½ gal.
The *seah*—⅓ ephah (2½ gal.)
The *ephah* (dry) 3 seahs (7½ gal.)
The *bath* (liq.) 3 seahs (1/10 homer)
The *lethech* (dry)—15 seahs (16 pecks)
The *homer*—(dry) 10 ephahs (32 pecks, 1 pint)
The *sextarius* or *pot*—Roman meas. for liq. (1½ pints)
The *choenix*—Grecian meas. for capacity (1½ pints)
The *firkin*—(7½ gal.—same as Hebrew bath.)

Weights and Coins

(Coins were originally weights) (value based on weight)
Gerah or *piece of money* = 1/20 shekel
Bekah = ½ shekel
Shekel—from which all other weights and coins are computed
Maneh or *Mina*—gold = 100 shekels
silver = 60 "
Talent = 3000 shekels
Mite = ⅜ farthing
Farthing = 1/10 denarius
Penny or denarius = Roman silver coin

The evolution of weights and measures, ancient and modern, is explained by the story of the cubits and the talents. These have come down in the many actual measurements of monuments and buildings, and even original wooden measures actually used by architects are still in existence, so that it is possible to actually determine definite cubit standards. Weights of stone, gold, haematite, glass, lead, and bronze and in shapes varying from bronze lions to barrels, eggs, glass scarabs, gold plates and cuboids are available to tell their part of the story of the development of weights and measures.

An interesting record of early measurements is found in the writings of a Chinese traveler who reports in 629 A. D. on measures of India.

"In point of measurements, there is first of all the yojana; this from the time of holy kings of old has been regarded as a day's march

for an army. . . . In the subdivision of distances a yojana is equal to eight krosas, a krosa is divided into 500 bows: a bow is divided into four cubits: a cubit is divided into 24 fingers, a finger is divided into 7 barleycorns and so on to a louse, a nit, a dust grain, a cow's hair, a sheep's hair, a hare's down, a copper water, and so on for seven divisions, till we come to a small grain of dust; this is divided sevenfold till we come to an excessively small grain of dust (anu): this cannot be divided further without arriving at nothingness, and so it is called the infinitely small (paramanu)."

From the time of the fall of the Roman Empire on through the dark ages and the middle ages there is little to be learned of weights and measures. There were no large empires holding sway, such as there had been, and the small kingdoms scattered over Europe made no great impress upon the times. Old standards were lost or destroyed, their names only remaining, and it was not until about 1300 A. D. that the system of weights and measures as it applies to us today began to again develop itself.

INFLUENCE OF EARLY ENGLISH UNITS

England naturally played an important part in the development of weights and measures and many of our present day units are derived from old English standards. Thus it is of interest to briefly review the more outstanding English units as they were authorized.

In 1266 by an act of Henry III the pound was established as 12 ounces, the wine gallon at 8 pounds and the bushel at 8 gallons.

Originally the troy and avoirdupois ounces weighed the same, but as English units were based on the weights and values of coins, when the values of the coins were later changed it was found that the avoirdupois ounce was 42½ grains lighter than the apothecary or troy ounce.

In 1618 the troy weight (derived from Troyes, France, a great trading center) was adopted by the College of Physicians of London so that today the apothecaries labor under a double system of weights, buying their supplies by the avoirdupois and selling by the troy system, a constant source of trouble and annoyance.

In 1760 a determined attempt was made to prepare definite standards and as a result the yard and troy pound were standardized and these same units are really in use today.

In 1816, a desire to prepare new standards which could be easily recovered in case of loss, resulted in the establishment of the

Imperial system, now in general use in Great Britain, thus adding still another set of units where there were already too many.

It will be noticed later that most of these early English units, now discarded, supplied the standards for our United States weights and measures, so that a unit of a given name is not likely to mean the same thing in England as it does to us. By the act of 1816 the yard of 36 inches was developed through the beat of a carefully regulated and controlled pendulum. The troy pound of 5760 grains was determined by comparison with a given measure of distilled water under certain conditions. The Imperial gallon contains 277 cubic inches, equivalent to 10 avoirdupois pounds of water and is divided into 8 pints, the pint however being divided into 20 ounces, each equivalent to 437½ grains of water. The bushel was made up of 8 Imperial gallons.

EARLY UNITED STATES UNITS

In the United States, standards used by the first colonies were of course those brought over from England before the act of 1816, and each colony more or less also developed units and standards of their own. Washington, as early as 1790 had urged the adoption of uniform standards in all the states, but it was not until many years later, in 1836, that Congress furnished each state with a duplicate set of standards, the troy pound of 5760 grains, the avoirdupois pound of 7000 grains and the yard of 36 inches, all based on the old discarded English standards. The U. S. gallon was taken from the old wine gallon of England, containing 231 cubic inches, equal to 8.33 av. pounds of water, and this was divided into 4 quarts of approximately 58 cubic inches each. The quart in turn equals 2 pints and the pint 16 ounces. The fluid ounce, however, contains 454 grains of water.

In 1866 the metric system was legalized in the U. S. although it was not made compulsory, and as international copies of the metric units were available to all nations, these have since served as standards upon which our common units are based, the yard for instance being $\frac{3600}{3937}$ of a meter.

In dry measures, the bushel, again differing from the British unit, was derived from an old abandoned English standard. It contains 2150 cu. in. equal to 77.2 pounds of water and is divided into 32 quarts containing approximately 67 cu. in. each. Thus it is seen that the dry and liquid quarts vary considerably, the former containing about 16 per cent or $\frac{1}{6}$ more than the latter.

THE AVOIRDUPOIS SYSTEM

The avoirdupois (av.) system of weights is used almost entirely for all commodities excepting precious metals, jewels and chemicals. It dates back to the Roman period, being derived from the Attic mina of 6845 grains or $\frac{1}{60}$ of the large Attic talent. The mina was also divided into 16 ounces, closely representing our modern ounce.

The largest unit of the avoirdupois system is the ton of 2240 pounds called the long ton, although there is also a short ton which contains only 2000 pounds. The pound of 7000 grains is divided into 16 ounces of 437½ grains each and the ounce is also divided into fractions of ½, ¼, ⅛. The latter, called a dram, is not however of the same value as the apothecary dram, nor is the ounce or pound of the same value as the apothecary ounce or pound. As a matter of fact we notice in the avoirdupois system itself that the ton is not always a ton.

THE TROY SYSTEM

The troy weights, consisting of a pound of 5760 grains is divided into 12 ounces of 480 grains each. This is the official standard for use in regulating coinage in the U. S. mint. The troy ounce of 480 grains, divided into 8 drams of 60 grains each and 3 scruples of 20 grains each, is used by the pharmacist today in dispensing medicines and is usually referred to as the apothecary system of weights. It must be remembered, however, that the pharmacist buys his medicines under the avoirdupois system and in selling them by the apothecary system he must constantly be alert and carefully determine his cost and selling price or he will wonder how it is that he has no profits at the end of the year.

The Metric System

ORIGIN

The credit for establishing and first adopting the metric system goes to France. For some time they had realized how confused were the various systems in use and at the time of the French Revolution they took advantage of the situation and established the metric system in 1799. However, due credit goes to an English inventor, James Watt, for proposing the decimal notation and the commensurability of the various units of weight, volume and length.

UNITS The basis for this new system, decided upon by a commission appointed to study the question, was a unit called the *meter* which was equal to one ten-millionth part of a quadrant of the earth through Paris, or in other words, one forty-millionth of the circumference of the earth at the poles, roughly 39.37 inches. The *liter* was defined as the volume of the cube of $\frac{1}{10}$ of a meter and the *gram* as the weight of $\frac{1}{1000}$ liter of distilled water at its maximum density of 4° C. These represent the fundamental units of the metric system for length, capacity and weight respectively. Other units are derived through divisions or multiplications by ten, and thus it is frequently called the decimal system.

SIMPLICITY The simplicity of the metric system may be readily visualized in the following chart.

Ratios	*Lengths*	*Volumes*	*Weights*
1000 000.			Millier or tonneau
100 000.			Quintal
10 000.	Myriameter		Myriagram
1 000.	Kilometer	Kiloliter or stere	Kilogram
100.	Hectometer	Hectoliter	Hectogram
10.	Dekameter	Dekaliter	Dekagram
1.	Meter	Liter	Gram
.1	Decimeter	Deciliter	Decigram
.01	Centimeter	Centiliter	Centigram
.001	Millimeter	Milliliter	Milligram

The metric system was repealed by Napoleon for a few years but again was made law and since that time practically every nation and country in the world except Great Britain and the United States have adopted it, while the latter two recognize it but do not make it compulsory.

INTERNATIONAL BUREAU Because of its international character and application, an International Bureau of Weights and Measures was established near Sevres, Frances, in 1875.

Here, in an underground vault, guarded by several doors, keys of which are in the hands of different countries, are stored the inter-

national prototype platinum-iridium meter bar and kilogram. Only once in six years is this vault opened and then only with great formality and in the presence of representatives of all countries.

This bureau is managed by an international committee and its object is to protect and safeguard these international standards and to make prototypes of them for the various subscribing countries. The United States prototypes of these units are in the custody of the Bureau of Standards at Washington. Extremely exacting care is required in making copies of these standards and their lengths are accurately determined and compared by the use of the microscope and light rays, the fundamental unit of the length in the metric system today being the wave length of a red ray of cadmium. This unit was adopted by the International Conference in 1927.

CONFUSION OF OUR COMMON UNITS

In the foregoing, we have mentioned some of the countless units of weights and measures now in use in our own country and if we were to attempt to cover them all we would find it an endless task. For instance we could consider the rod, chain, furlong, skein, the land or the sea mile, the acre, barrel, pipe, clove, sack, nail, ell, to say nothing of the way in which all of these units vary according to states and use.

Our most common units are confusing enough and that old story of "which is the heavier, a pound of gold or a pound of feathers"? is not the type of joke we think it is. If we went to the mint and bought a pound of gold we would receive 12 ounces (troy pound), and if we then proceeded to buy a pound of golden feathers we would receive 16 ounces (avoirdupois pound) and find that we did not have money enough to pay for it. Or let us try to buy some coal with which to keep warm on these cold wintry days. We order a ton but how much do we get? Well that depends on who you are, where you are, and how much money you have, together with who you buy your coal from. So again we see that a pound is not a pound and a ton is not a ton any more than an ounce is not an ounce and neither is it an ounce.

How well we all recall the days spent with our arithmetics trying to figure out the value of a crop of grain on a farm measuring 2325 ft. by 1245 ft. and producing 25 bushels to the acre, the price of grain being quoted at $2\frac{2}{3}$ cents per pound. And that was only one problem! Think of the tables involved and the time spent in

learning such tables! Now compare these with the metric system where from one small unit, the centimeter for instance, one could so easily construct the entire group covering length, volume and weight. A cubic centimeter multiplied 1000 times gives the liter by which we could measure volume. That same cubic centimeter filled with water would weigh one gram, our unit of weight, and by multiplying the side of that cubic centimeter by 100 we obtain the meter, our unit of length. Multiply the meter by 1000 and we have the kilometer, the unit for distance. The meter squared gives us a means of determining area usually expressed in terms of 100 square meters or the *are*. Thus we see the intensely practical application and the simplicity of the system with its units of tens and now we notice how much it resembles our own coinage system, the best in the world. It does not take a child long to discover that 10 cents made a dime, 10 dimes, a dollar and so forth and he finds it so easy to visualize and compare one coin with another.

That the time will come when the United States and Great Britain will adopt the metric system is certain and were it not for definitely organized opposition on the part of a group who will not or can not understand its great value, we would be operating under it at the present time.

These opponents will not listen to any reason and offer all sorts of obstacles. They consistently refrain from thinking in terms of the metric systems but prefer to use old units and then say "now look at that equivalent in the metric system." For instance they will show you that a mile equals 1.609 kilometers or a kilogram equals 2.205 pounds and thus try to set up a sense of confusion, where were the metric system adopted we would soon become accustomed to thinking in terms of kilograms and kilometers and then a kilogram would be equal to 2.6792 troy pounds or 2.2046 av. pounds and a kilometer would equal 0.6214 land miles or 0.5396 nautical miles and the tables would be turned. Wonderful units these pounds and miles!

THE YARD AND KING HENRY'S NOSE

Time does not permit of further detail of this most interesting phase of weights and measures but let me quote what Alexander McAdie has to say about it all.

"The schoolboy trying to memorize the table of liquid weights and measures suffers because an hour later he doesn't know whether

three drams make a scruple or eight scruples make a dram. Now he has it!

> Three drops make one minim,
> Eight minims make one scruple
> Three scruples make one dram
> Two or three drams make one drunk."

And he continues: "More than eight hundred years ago there lived a king—an English king, one Henry—early in his reign gray bearded Councilors declared that in their opinion it would be nice to have a measure of length called a yard; and this should be the distance between the tip of royal Henry's nose and the end of the royal thumb. The king's nose may have been large or small or tilted upward. Moreover, the distance may have been measured when the King's nose was swollen, for royal noses can hit a door post in the dark just like common noses. And the royal thumb may have been stubby or spatulate. We of the twentieth century should never forget that every time we buy a yard of ribbon we measure more or less accurately the distance between a defunct exroyal nose and a departed exroyal thumb. Henry is gone and he took his nose and his thumb with him. We cannot very well standardize our yard by comparison with the original: nor can we even find the bit of string or stick or whatever they used to determine the exact distance between the proboscis and the thumb."

Now is the time to put an end to this burlesque and unite all the world with a common bond capable of being understood by all nations both far and near, a bond that would do a great deal to settle the world and make it a peaceful planet on which to live.

Enforcement

ORIGIN OF CUNNING AND CRAFTINESS

Another phase of the question of weights and measures is that in relation to its enforcement. This is no new problem by any means for we only need turn to the Bible to find one reference after another bearing on this subject. The Israelites were so accustomed to the use of weights and measures that they began to employ false weights and wrong measures, with the result that not once but many times their prophets and teachers were forced to emphasize honest dealing in matters of measurements and the weighings of daily life. Turning

to Leviticus XIX 35 we find the following: "Ye shall do no unrighteousness in judgment, in measures of length, of weight or of quality. Just balances, just weights, a just ephah and a just hin, shall ye have." and in Deuteronomy XXV 13-16: "Thou shalt not have in thy bag diverse weights, a great and a small. Thou shalt not have in thy house diverse measures, a great and a small—a perfect and just weight shalt thou have; a perfect and just measure shalt thou have."

Josephus gives credit to Cain for the introduction of weights and measures saying, "He also introduced a change in that way of simplicity wherein men lived before; and whereas they lived innocently and generously while they knew nothing of such arts, he changed the world into cunning and craftiness."

And indeed this cunning and craftiness still persists today and were it not for a great body of efficient and well organized men who are continually on the alert for such practices, we would constantly be required to carefully examine everything we purchase to insure our receiving what we pay for. Even today we occasionally find flagrant cases where a dealer will connive to cheat by one means or another but it is nothing compared to the practices found in our own city for instance 15 years ago, when the Bureau of Weights and Measures was first established to fight this evil.

ILLEGAL BALANCES AND WEIGHTS

A few examples of the cases found may be of interest. Probably the worst trouble arose through the use of scales which were unfit from age or were "fixed" to give wrong weights. Some of the illustrations here show this feature very strikingly. For instance the ice scale with a 50-pound weight records the neat sum of 64 pounds; a spring scale found in a small shop shows 5½ pounds for a pound weight; a spring balance, so frequently found in meat shops, shows the graduation advanced 2 ounces; a counter scale, with bearings so worn that again an additional 2 ounces is required to give the proper equilibrium; a counter balance with lead and iron tied underneath the pan. Then again worn out weights and altered weights caused trouble. One set of weights shown were picked up at a junk dealers; he used the light weight when he bought the goods and the heavy one when he sold them. Light weights of this kind were frequently found in the shops and came to be known as Saturday night weights, as they were usually brought out on Saturday night when

business was at its height. The practices of tying a string to the scale and drawing down on it with one hand or by a foot lever to indicate additional weight, or bearing down on the scale with the tip of a knife were all frequently met.

ILLEGAL MEASURES

Baskets and dry measures were another source of trouble, but here deception was usually always intentional. Examples here show baskets with false bottoms; baskets made with staves, one stave being removed from the side and the basket drawn together again; baskets with wires drawn tightly around the center thus decreasing the capacity; baskets that are tall and deep, making it difficult to pack; baskets of nearly the

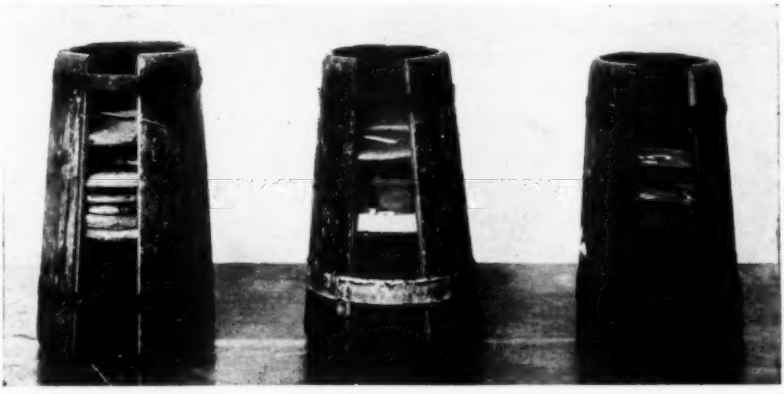

Fig. 1—Fraudulent Dry Measures. (Partition stuffed and sides also drawn together, resulting in a shortage of from 47 per cent. to 56¼ per cent.)

same size but not marked and the smaller frequently passing for the larger unit. Liquid measures also came in for their share of error, with false bottoms inserted or sides dented in, thus decreasing volume again. Milk bottles varying by a wide margin, yard sticks made or worn short, together with short measurements through the old custom of driving brass tacks into a counter, as a means of taking measure. Gasoline tanks and pumps, oil cans or bottles and in fact everything that had to do with weights and measures were found at fault. These are only a few of the hundreds of examples found, and when we see the figures and find that some 185,000 separate pieces of weighing and measuring apparatus were examined by the bureau in its first year of activity and that 31 per cent. or about ⅓ of these were confiscated, we can see what it means to have such a bureau. Estimates

prepared on that basis showed that in Philadelphia alone over $40,000,000 was being lost to purchasers per year. Today this has been almost entirely eliminated and we can usually rest assured that we are getting what we pay for, particularly when we trade at reputable shops.

ENFORCEMENT UNITS

The enforcement of these standards begins with our national government where we find the Bureau of Standards as custodian of the standards for the United States. The Bureau supplies the individual States with copies of these standards, the States in turn supplying the cities and towns. Large organizations will even have their own equipment with which to test out the various types of measuring and weighing devices under their control, recognizing this as a business obligation and it is seldom that an official of a weights and measures bureau ever need concern himself over conditions in such an institution. Testing of weights and measures covers an endless array of material, from the ordinary types, as we might think of them, even on to include such things as water and gas meters. For the large scales used by railroads in weighing loaded freight cars, special test cars are constructed. The Bureau of Standards operates such a car, it being used to test out the various test cars and master scales with which most railroads are equipped. The railroads then send their test cars over their system, rechecking the scales in the various yards as they go along. A very carefully designed and sensitive master test scale recently installed in one of the shops of the Pennsylvania has a capacity of 150,000 pounds. In a test of 100,000 pounds this scale deviated only $\frac{3}{10}$ of a pound (less than five ounces) and in a recheck it showed only $\frac{1}{10}$ of a pound deviation. It is enormous in size but still of such delicate construction that by merely breathing on some of its levers is enough to change its indications more than a pound.

Scales and Balances

Scales or balances are probably more or less well known to every individual and today we have practically as many different and varied uses for scales as we have industries. The balances of the drug store, of the meat shop or grocery are more or less common but we shall see later where these are practically lost when we consider the many other applications of the balance.

EARLY WEIGHING

Several Bible references to weighing have already been mentioned and on the temple walls of Egypt we find the oldest known illustrations of the process of weighing. Here a scale appears with gold rings on one side, balanced by an ox head on the other. While early scales were crude in appearance, the underlying principles based on physical laws have not changed. True, these principles have been greatly elaborated upon in the development of this modern industry but the old Egyptian or Roman steelyard, consisting of an unsupported beam developed into a single lever scale, this into compound levers and so on until we now have scales with leverage systems which appear very complicated but fundamentally are based on the same physical laws which made the steelyard practical.

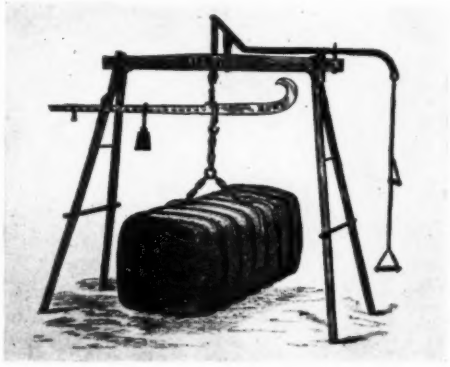

Fig. 2—The Steelyard Principle as Shown by a Cotton Beam.

SPRING BALANCES

In operating principle, scales might be conveniently classified into several groups. The first of these represents the simple spring balance, usually seen dangling from the rear of an ice wagon. This consists of a piece of heavy tightly coiled steel wire, having decided elasticity, to which an indicator is directly attached and which shows on a permanent scale the weight or pull of a mass when fastened by a hook to the lower end of the spring. Care is taken in manufacturing scales of this type to see that the coil or spring is checked before it reaches its critical point or that point where it would no longer snap back to its original starting position. These scales of course are not practical for exacting work.

Another application of this spring and one which can be made to give accurate results, is found in the dial face scale so frequently used in meat shops. The principle is the same here excepting that the needle or indicator is made to swing over a round dial, clock fashion, and very often two springs are involved to give better accuracy and so arranged that there is no change in the scale due to different temperatures and varied weather conditions. Valuable

Fig. 3—Analytical Balance.

features of these scales lie in the fact that they are very convenient to use, they give rapid results, and there are no loose weights to handle, although for accuracy they do not compare with the lever type which rest on knife edges.

LEVER BALANCES

The second classification comprises the group of lever scales, based on the old steelyard, consisting of a single beam so hung that it is divided into two arms. If the arms are of equal length an object supported from one end

will require a weight of equal mass on the opposite end to effect equilibrium. If, however, and here is where it great practicability comes in, the beam is supported so that the two arms are unequal, then the masses required at the end of each section or lever are found to be inversely proportional to the length of the lever. For instance, if one lever is one foot in length and the other has a length of two feet, then a two pound weight on the first lever will only require a one

Fig. 4—Delicate Assay Balance.

pound weight on the second to counterbalance it. Visualize now such a beam, divided let us say into 2 inches and 8½ feet or 100 inches. A 50 pound weight on the 2 inch lever will then only require a 1 pound weight on the 100 inch lever to balance it, while a 10 pound weight would counterbalance 500 pounds. It is this principle which was used in early scales, and later by multiplying the levers this ratio was increased many fold until today we find scales capable

of weighing a thousand tons and the readings still made on comparatively short bars.

In the group of equal arm balances we find those with the scale pans hung below the beam, a type principally used by pharmacists and analysts, owing to their extreme sensitivity, and those with the scale pans supported above the beam, as in the common counter scale found in pharmacies. The pharmacists prescription

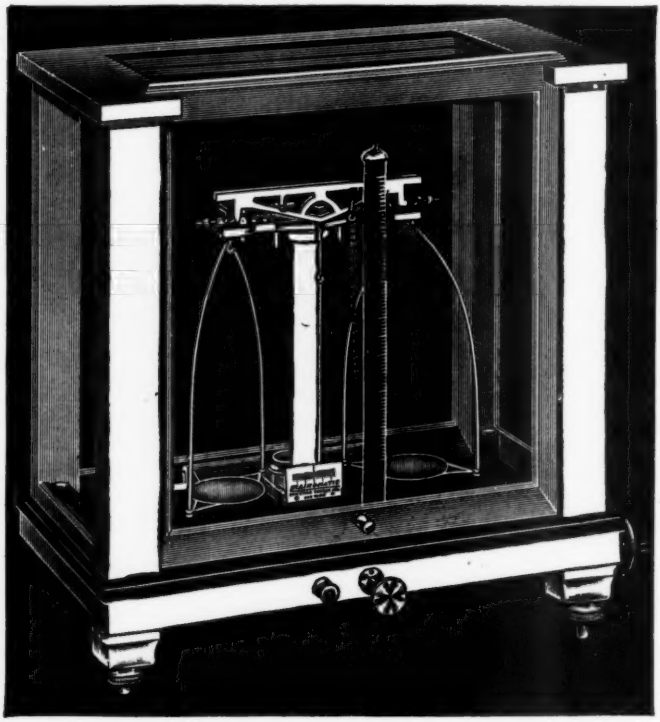

Fig. 5—Chainomatic Analytical Balance. (Fine adjustments are regulated by automatically raising or lowering the chain.)

balance or the analytical balance we find made with the highest degree of care and skill and it represents the simplest as well as the most accurate although it takes care and time for adjustment. The beam is made of carefully selected metal as it must be firm and rigid under the heaviest load or strain. The beam is supported and the pans hung on knife edges of the hardest steel or agate, so that there is very little friction to slow up the action of the balance. Besides

using loose weights many of these balances are equipped with graduated beams upon which small weights slide, thus capable of giving extremely fine subdivisions.

The group of unequal arm scales is so extended that it would be impossible to mention all of its applications here. The more common of these are recognized in counter scales, automatic personal weighing machines, platform scales in the industries, automatic computing scales and so on.

TORSION BALANCES

Still another class is represented by the torsion balance. The principle here is different from any we have mentioned heretofore and is based on the fact that when a steel band, for instance, is twisted out of its fixed or natural position, it exerts a strong pull or force to correct its position to normal. In the torsion balance this is taken advantage of

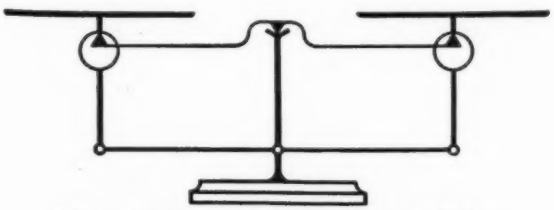

Fig. 6—Diagram of the Torsion Balance Principle.

by tightly drawing flattened metallic bands over rectangular forms, the beam and scale pans being fastened to the bands on these frames. When one pan is depressed by a certain force it twists the framework and we find that by exerting an equal force on the opposite pan, the framework returns to its normal position and the two pans are again in a state of equilibrium. Torsion balances are available for counter use and are made extremely sensitive for prescription use in pharmacies.

PLATE FULCRUM SCALE

The latest principle as applied to the manufacture of scales lies in the use of what is known as the plate fulcrum in which the arms of the scale are fastened together with flexure plates thus doing away with the question of friction and wear which has been the source of so much annoyance and trouble in scales supported on

knife edges and bearings. This principle finds practical application at the present time only in the manufacture of large scales, it being developed primarily to fit the need of railroads in weighing freight trains, etc.

Wonders of Weight and Measurement

This brings us to the consideration of some of the wonders of weighing and measuring today. When scales or balances are mentioned the majority of us pass it by recalling probably the scale ob-

Fig. 7—Fine Torsion Balance for the Prescription Counter.

served in the delicatessen, candy kitchen or pharmacy, or we think of measuring in terms of inches, pounds, ounces, or gallons. But let us look for a moment at some of the other applications of the subject and we will soon realize that this is truly man's great art. Plato has said that "if from any art you take away that which concerns weighing, measuring and arithmetic, how little is left of that art," and were Plato alive today he probably would not change that statement one bit.

The development of the sciences and industries has added untold additional units of measurement, too numerous to mention. Our original weight and measure units have extended to the field of the microscope and telescope, and we thus have millimicrons and the still smaller Angstroem unit, of which it requires 254,000,000 to make one inch, used in spectrum analysis for the measurement of light waves. The greatest unit for distance is the "light year," which is the distance which light will travel in one year or about 6,000,000,000,000 (six million million) miles.

THE COMPUTING SCALE OR MATHEMATICS WIZARD

We might first note the further development in the use of scales and how they are made almost human in their service. We have all probably wondered at one time or another and have frequently heard housewives exclaim over the manner in which a butcher can place

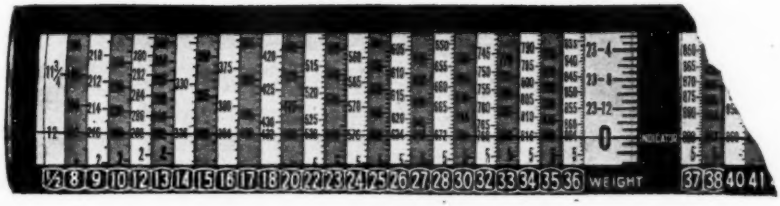

Fig. 8—Chart of a Computing Scale.

a chicken worth forty-three cents a pound on his scale and the moment the scale comes to rest, while you are still trying to read off the number of pounds and ounces, he calls out "two seventy-three," and this is no round figure or bargain price either but the actual cost of 6 pounds 5½ ounces of fowl at 43 cents per pound. It is not the butcher but his scale that is such a mathematics wizard, for we find the scale equipped with a revolving cylinder covered with a paper chart equipped with row after row of figures which are nothing more than muliplication tables. One column indicates prices for meats selling at 43 cents per pound, other columns those for 42, 43, 44 and so on and likewise the computed price for one pound, two pounds and all the intervening fractions are indicated including the extremes both high and low. As the scale is used the cylinder re-

volves, comes to rest and, in the case of our chicken, one simply reads off the figures on the line with the 43 cent column and that is all there is to it. No paper and pencil and no errors when you use this mechanical mathematician! We can see now how the use of this principle is easily extended into almost any line, for the chart may be made to conform to the requirements of varied industries. For instance, suppose we were to use it to count nails. The number or size of the nail would replace the price per pound figure above, and the total number of nails weighed would be indicated

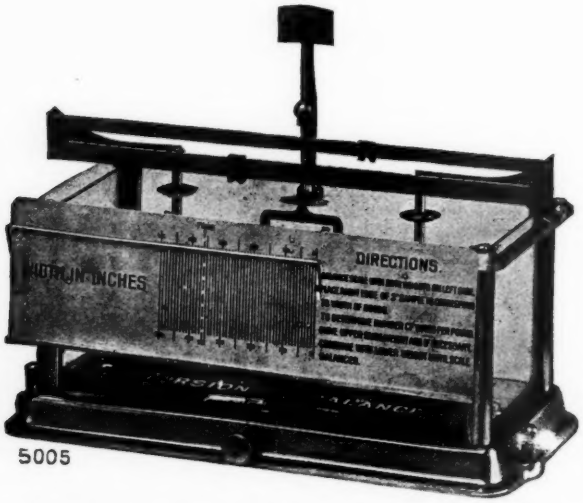

Fig. 9—Cotton Goods Balance Indicating Yards Per Pound.

in place of the computed price of our chicken. Incidentally the use of scales for counting small objects, for measuring the length of a bolt of cloth or to obtain the number of pints or gallons of liquid in a container is quite marked. One needs but to weigh the lot, and knowing the weight of the unit, it is a simple matter to calculate the total number of such units. Here again many scales are equipped to give these readings direct, similar to the system referred to above or by an ingenious method of using a given number of the items as a unit of weight, the total number being weighed or counted then being indicated on the beam in multiples of this unit.

AUTOMATIC DISCHARGING SCALES

There are also the self discharging scales which automatically weigh a certain amount of material into a container, discharge that container and immediately fill the next. Most of our package goods as sugar, coffee and similar articles are packaged in this manner. And not only is this principle carried out on the small scale but it is also practical in a large way in weighing coal, grain, sand, etc. When a certain weight is reached the source of supply is automatically shut off, the bin is emptied and then the supply chute is again opened. Huge grain scales handle thousands of bushels of grain with a capacity of 500 bushels at each weighing.

The scale in the up to date coal yard weighs out five tons of coal to within 3 ounces, prints the weight on a slip of paper and all

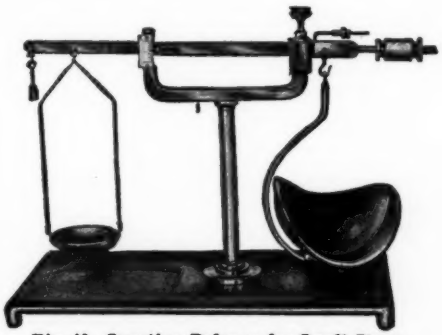

Fig. 10—Counting Balance for Small Items.

without the service of any attendant. Many shipping rooms use this type of service today, weighing all shipments on an automatic recording scale and thus they are able to check any claims of shortage very readily.

CONVEYOR AND SHEET GOODS SCALES

Another type of scale is the one attached to a conveyor whereby the material in passing over belts is automatically weighed and recorded. And again the scale which is attached to machines whereby the weight of continuous sheet goods is controlled during the process of manufacture. By setting the scale at a definite point with a weight pendulum, any variation in the thickness or weight will instantly be recorded and adjustment may be made to the machine as necessary.

By this method there is no necessity for stopping the machine to make a test or to caliper or gauge the material. It is used for such industries as manufacture roofing paper, auto top covers, etc.

MASTER SCALES FOR RAILROADS

Probably one of the most valuable uses of scales is found in the railroad service. When we realize that the entire revenue derived by a railroad from its freight traffic is determined directly by weight, we can get some idea of what this means. One track scale alone on the Pennsylvania railroad determines freight charges of approximately $50,000,000 annually. Not only do they need small scales for small

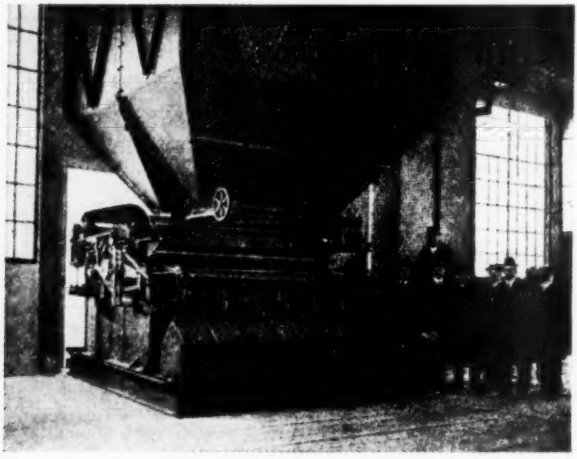

Fig. 11—Huge Grain Scale.

packages but they also require scales large enough to weigh freight trains. These latter scales are remarkable not only for their size, ranging as high as 100 feet long and of 1,600,000 pounds capacity, but also for the accuracy with which they record the weights of heavily loaded cars, being sensitive to within 5 pounds. The scales themselves made of huge steel girders are set up underground, while the operating chamber or office is some distance away and elevated to obtain a clear view of the surrounding track. If a freight train is to be weighed it is pushed up a special track until the first car is forced over an artificial hump when it breaks away from the train and coasts

down hill and over the track scale at such a uniform rate of speed that there is time to make the necessary reading before it passes off the scale. One car after another follows at stated intervals, each one being weighed in a comparatively short time. One track scale on the Pennsylvania has a record of weighing about 1½ cars every minute for an entire month and has weighed 10 cars in 1 minute and 44 seconds in a test, an average of one car for every 10½ seconds. Compare that with the time it takes you to get your weight on a penny slot machine the next time you get weighed.

ULTRA PRECISION MACHINES FOR WEIGHING AND MEASURING

Nearly every scientific discovery of modern times has been in whole or in part the result of measuring instruments of remarkable refinement, and at the Bureau of Standards at Washington one is able to find many of these pieces of ultra precision in operation. There we

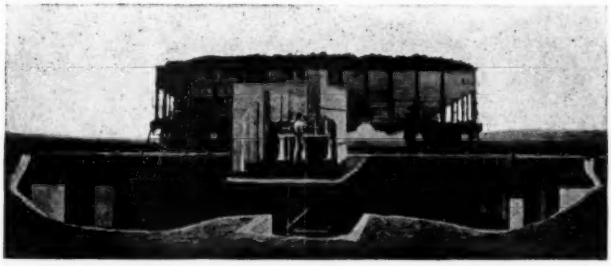

Fig. 12—Railroad Track Scale (Plate-Fulcrum Principle).

find a weighing machine which is so sensitive that even body heat causes it to deviate, and the operator is forced to manipulate its weights by means of rods from another room, and he reads the indicator with a telescope. The room in which the balance is kept must be kept at uniform temperature, for even ½° rise or fall at the time weighing is being done or even for several hours beforehand would hinder the work.

One balance is used in a vacuum to avoid the buoyant action of air. And so sensitive that it registers the decrease in a piece of metal when moved two inches further from the surface of the earth.

The smallest weights in actual use here are $\frac{1}{20}$ milligram or 1/6,000,000 of an ounce. They are made of aluminum, finer than

tissue paper and smaller than a pin head. The balance on which they weigh will accurately weigh to within 1/30,000,000 of an ounce.

The standard measures of length are so delicate that their scales can only be read by the aid of a microscope magnifying 50 diameters, and which must be packed in ice when being used, so that they do not change their shape with variation in heat.

Minute measures of length are not determined by the yard stick or even the ocular micrometer but by means of light rays so sensitive that a bar of steel 3 feet by 3½ inches may be bent by placing a calling card upon it, the bending being indicated by the reflected rays of light in the form of concentric rings, such as we see when a

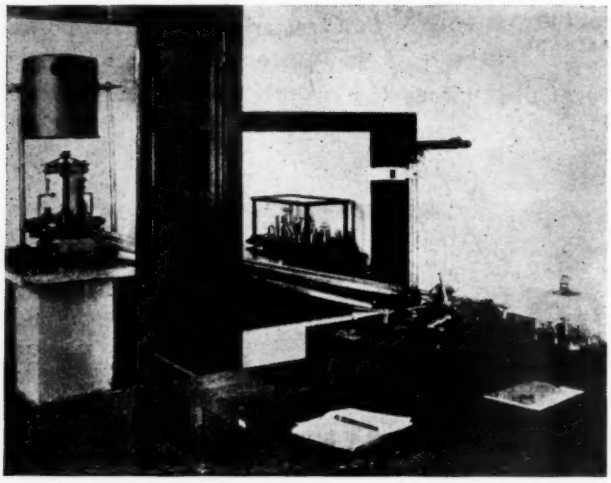

Fig. 13—Precision Balance with Distant Control (U. S. Bureau of Standards).

stone is thrown into a body of water. As each new circle forms, the bar has been bent 1/100,000 of an inch. This device is known as the interferometer and is used in fine researches, particularly in fixing standards of length and measuring light waves.

Another wonder is a giant testing machine that can pull asunder a 5 inch steel shaft, registering the pull to at least 2,000,000 pounds and immediately afterwards crush an egg shell and register the pressure required with great accuracy.

Another device recently set to work consists of a small instrument which is capable of recording the heat of the stars and far off planets. It will record the heat of a candle 100 miles away.

Again there is the device for measuring liquids which is sensitive to 0.001 cc. or about $\frac{1}{60}$ of a drop. This quantity is determined by the weight of mercury necessary to displace the lost liquid.

WEIGHING THE EARTH

Some of you have probably recently noticed the various articles appearing in our papers and magazines on the work recently completed by another bureau scientist, Dr. Paul Heyl. Dr. Heyl, after years of work, has weighed

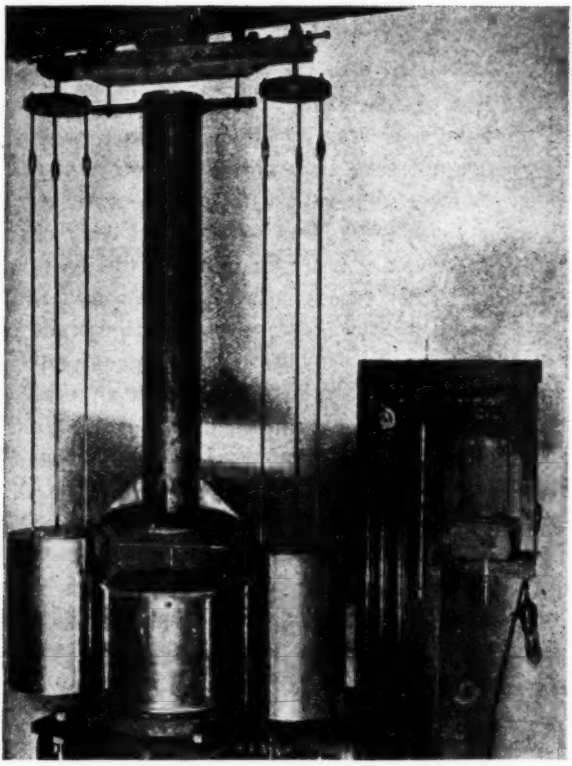

Fig. 14—Torsion Balance Used to Weigh the Earth.

the earth and finds it to weigh 6,000,000,000,000,000,000,000, (six thousand million million million tons) a sum so large it really means nothing to us. True, he did not weigh it with a balance or scale, but by means of a most delicate instrument which required that the work be done some 35 feet underground, where the temperature is always uniform no matter what the weather outside. The work was based

on the attraction of one body for another and was determined by observing through a telescope the swing of a very sensitive pendulum. Day after day figures were copied down as the pendulum swung over its course and from these figures his results were calculated. It is really a check up on what is known as gravitational force and the results are not primarily of value as far as knowing what the earth actually weighs but are used by scientists in the study of measurements of the sun, moon and stars and also aid in solving the question of the earth's core.

MOLECULES, ATOMS AND ELECTRONS

We often hear the expression after an explosion, of this or that being "blown to atoms," but scientists have now literally blown the atom to atoms and we are not sure even now that there will not be a further explosion. A molecule, or its child the atom, or the grandchild the electron, which is considered as an electrical body charged either negatively or positively, are not measured by the foot rule nor by the telescope, but by their reactions and behavior under certain conditions, together with a series of mathematical calculations. It is said that if a bottle containing about 1 cc. or approximately a quarter of a teaspoonful of ordinary air, has pierced in it a minute opening so that 100,000,000 molecules (a number nearly equal to the population of the United States) pass out every second, it would take not minutes or hours, nor days, but nearly 9000 years for all the molecules to escape. If you could pile 100,000 atoms on top of one another they would give you an atom sandwich about the thickness of a cigarette paper, while 100,000 negative corpuscles of which the atom is composed would just reach across the diameter of an atom.

With figures such as these and with instruments of precision as remarkable as we have shown them to be, is it any wonder that the art of measurement is called man's master art, and are we not led to wonder to what lands of rare enchantment that art will lead man before he is overcome with the greatness of it all.

If the story of man and his weights and measures as here outlined has given you a new sense of appreciation of this subject, as it has given me in preparing it, I shall feel well repaid, and I trust that when you shop hereafter, the scale or balance used to weigh out your wants, will recall to your mind some of the romance of the family that has made such a name for itself and apparently is still in its youth.

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NOTES ON SOME TESTS FOR ACETONE AND ALDEHYDE

By Henry Leffmann

MANY TESTS have been proposed for acetone, the main incentive being probably its frequent occurrence in urine and its diagnostic value. Many tests have also been proposed for aldehyde (by which acetaldehyde is always meant in this paper), but its detection is not considered of medical importance. Its frequent occurrence in distilled spirits, especially those made surreptitiously ("moonshine"), has made its detection and determination necessary in the control of the illicit liquor traffic. Doran and Beyer (*Amer. J. Public Health,* 1923, **13**, 831) reported analysis of confiscated distilled liquors containing appreciable amounts of aldehyde.

The desirable characters of qualitative tests are certainty and delicacy, but it is by no means always possible to secure both in one procedure. The spectroscopic test for lithium combines them in a high degree and so do many tests in inorganic chemistry, but the detection of organic substances is often less certain and less delicate. Many of the descriptions of tests for acetone and aldehyde make no mention

of interferences, especially no statement whether aldehyde masks or simulates acetone and similarly with the tests for aldehyde. Since several of the familiar tests for one of these give similar results with the other, it seemed worth while to study some recently proposed procedures, to determine whether simulation also occurs. The most used tests are made with chemicals commonly in stock in the laboratory, but some recently proposed require complex synthetic compounds. American chemists are fortunate in having available the long list of synthetics made by the Eastman Company.

It will not be necessary to describe the standard tests. They are fully set forth in the textbooks, though, as noted above, not always with as much information as might be concerning interferences and uncertainties. The tests here discussed are partly for acetone and partly for aldehyde. They have been tried with both substances and also with formaldehyde. Dilute solutions were as a rule used. A few cc. of the substance was diluted with water to 250 cc. and portions used. Aldehyde reacts to alkaline silver solution and also to Schiff's test. The latter gives a bright red, but formaldehyde a decidedly bluish tint. Acetone gave a slight tint, possibly due to traces of aldehyde.

Among the delicate tests for acetone is with sodium nitroprussid and ethylenediammonium hydroxid (often termed ethylenediamine hydrate). The value of this was carefully examined by Mr. H. J. Schaeffer, then a member of the graduating class in the Science Department of the Philadelphia College of Pharmacy and Science. His results were published as his thesis in *Amer. J. Pharm.* (1926, **98**, 643). He found the reagent to be very delicate, but regards it as of little practical importance on account of cost (40 cents a gram and not easy to obtain even at that rate). For ordinary work, especially in the clinical laboratory, such high accuracy is not required and the test will probably remain rather academic.

Kahlenberg reported to *Science* (1925, **61**, 344) a communication from Bülow recommending an alcoholic solution of 2-4 dinitrophenylhydrazin, slightly acidulated with hydrochloric acid as a test for acetone. The reagent is a yellow crystalline powder, and the precipitate also crystalline, showing long narrow forms like knife-blades and the chestnut-burr groups common in hydrazin precipitates. Early notice of the principles on which this test is based are to be found in a paper by Purgotti in *Gazz. Chim. Ital.* 1893, **23**, 225, and several papers by Curtius in *J. prakt. Chem.* 1894, **50**.

The Fabinyi-Frommer test for acetone originally appearing in a German medical journal, is noted in *C. A.* 1918, **12**, 2180, this being an abstract of a review of acetone tests by Kolthoff, in *Pharm. Weekb.* 1918, **55**, 1021. This is with solid alkali and salicyl aldehyde. Potassium hydroxide is recommended in the original description, but sodium hydroxide serves equally well. A few drops of salicyl aldehyde are put into the sample and a small fragment of sodium hydroxide dropped in. A red ring is formed. This constitutes a very delicate test for acetone, but a similar reaction is obtained with aldehyde. An alcoholic solution of vanillin can be substituted for the salicyl aldehyde with results sufficient for all practical purposes. Dr. Max Trumper has used this test many times in testing urine and found it entirely satisfactory. Aldehyde will also give a red ring with sodium hydroxide and acetone, but the reaction is of no practical importance. The synthetic ethylvanillin reacts in the same way as the normal vanillin.

Stepp reported in *Zeits. Physiolog. Chem.* 1921, **114**, 301, as an excellent test for aldehyde, dimethyldihydroresorcinol usually listed with omission of the second "di" and for convenience abbreviated by Stepp to "dimedon." He recommends an alcoholic solution and the addition of a small amount of sodium chloride, but it seems to me from trial that the sodium salt may be omitted and the solution made in water. This reagent gives well-marked crystalline precipitates with all aldehydes tried. Formaldehyde gives always long slender needles; aldehyde generally short broad forms largely interlocked as X's, but this seems not to be constant, the needle forms being occasionally produced. The formaldehyde precipitate tends to remain suspended in the solution or even collect at the top, but the aldehyde precipitate settles promptly in most cases. The reaction with formaldehyde is quick, but with aldehyde somewhat slow. Stepp recommends that the mixture be allowed to stand overnight. The difference of crystalline forms gave hopes that a method of detecting formaldehyde and aldehyde in presence of each other could be based on the use of the reagent, but this has not yet been established. Further experimenting will be carried out. Stepp gives a statement of the reaction between the reagent and alhehyde, but his formulas are in confusion. The reaction is that two molecules of the reagent lose each an atom of the additive H; the O of the aldehyde unites with these to form a molecule of water, the residue of the aldehyde molecule acting as a conjugate for the two residues of the reagent.

As a result of these trials it seems that the newer reagents have no great advantages either for delicacy or certainty. The alkali-vanillin test is quite sufficient for routine clinical work, and salicyl aldehyde is even more delicate. The special reagents used were obtained from the Eastman Company.

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PHARMACEUTICAL DEVELOPMENTS IN CHINA

By John Cameron, F. C. S., Ph. C.

THE STATUS of Pharmacy in China.—In the spring of 1928 the National Medical Association of China, an entirely Chinese organisation, held their seventh biennial conference in Peking, and for the first time in history the Executive Committee of this organisation requested the Peking Pharmaceutical Society to participate officially in the conference.

The society responded with a very fine pharmaceutical display of crude drugs, native to China, which could be used in pharmaceutical practise, with a display of various ephedras and different stages in the extraction and crystallisation of ephedrine hydrochloride, with a display of chaulmoogra nuts and the various stages in the preparation of the ethyl esters of chaulmoogra oil and with a small Eureka tablet machine in action.

The exhibit was visited by all the members of the conference and was much appreciated by the medical men.

One session of the conference was reserved for pharmaceutical papers and five interesting papers were read by members of the Peking Pharmaceutical Society. The writer was requested to address the whole conference group on "Pharmaceutical Education in China."

It is gratifying to know that pharmacy is at last being recognised by the younger generation of Chinese medical men as an important science and a science that is very closely bound up with the advance of Western medicine in China.

Meetings of the Society.—During 1928 the society met regularly twice monthly and were fortunate in securing good lecturers. The

meetings were well attended. On account of some of the members not having a working knowledge of English, the president proposed early in the year that at one meeting a month the lecture should be delivered in Chinese. This new idea was much appreciated by those members of the society who did not speak English fluently, and it has become the rule now that at one meeting per month the Chinese language only is used.

Name of Society.—In June, 1928, it was decided to change the name of the society from Peking Pharmaceutical Society to The North China Pharmaceutical Society, so that this body should include, if possible, all pharmacists in North China. Only Chinese are eligible for full membership or associateship in the society. Foreign pharmacists resident in North China have been elected honorary members. It is interesting to note that pharmacy is being taught in only three institutions at present:

1. Shantung Christian University, Shantung.
2. Mukden Medical College, Mukden.
3. Peking Union Medical College, Peking.

There is a foreign pharmacist in charge of the department of pharmacy in each of these institutions. It is the aim of the society to form the connecting link between these different pharmacies and, if possible, to award diplomas to successful students of pharmacy in these three institutions. In this way it is hoped that the society will ultimately be responsible for the granting of certificates and diplomas in pharmacy for the whole of North China. When the time comes to establish a Chinese Pharmaceutical Society under either the Ministry of Education or the Ministry of Health, this society should be in a position to represent organised pharmacy in North China and would automatically be called on to assist in the formation of a national organisation.

Chinese Pharmacopœia.—Since the establishment of the Nationalist Government in Nanking there has been a great deal of activity in the Ministry of Health. Amongst other things the ministry has decided that it is essential for China to have her own pharmacopœia, and they have accordingly appointed a group of Chinese pharmacists to take up the matter of preparing a Chinese Pharmacopœia and it is anticipated that this publication will be ready for the press in the fall of this year (1929). The past president of the North China Pharma-

ceutical Society, Mr. Moody Meng, Ph. C., was called to Nanking on December 31st, he having been appointed pharmacist to the Ministry of Health and a member of the Pharmacopœia Committee. The society deeply appreciated the honour which had been done them by the Ministry of Health and they gave Mr. Meng a hearty send-off.

The Chinese Pharmacopœia, which, when published in the fall, will become the official standard for all pharmaceutical chemicals and drugs in this country, will, we understand, be printed in Chinese. There is a possibility however, of the ministry deciding to have some English references in the book, but the final method of presentation has not yet been decided upon.

The decision of the Ministry of Health to have a Chinese Pharmacopœia published is surely a very significant indication of the importance of pharmacy amongst the younger men in the New Nationalist Government, and it seems to the writer that we are about to enter an era when pharmacy in this country will have a chance to emerge from the obscurity which has hidden it for many centuries.

Pharmaceutical Laboratories.—It is the intention of the Ministry of Health of the Nationalist Government to establish and equip one or two pharmaceutical laboratories in this country where chemicals and drugs can be tested and assayed. These labs. will employ qualified Chinese pharmacists and in this way there will be something officially done to stimulate the scientific side of pharmaceutical practise in this country.

Trained Pharmacists.—With the continued expansion of Western medicine throughout China, there is a growing demand for qualified Chinese pharmacists who will handle intelligently the many prescriptions which are now being written by Chinese medical men who have graduated in Western medicine. The day has passed when a lab. assistant or trained nurse may take the place of a person who has had four years' training in theoretical and practical pharmacy. During the past year (1928) we have been overwhelmed with letters from young Chinese who wish to take up the study of pharmacy seriously. Unfortunately our accommodation is limited here and we have had to inform these applicants that they must look elsewhere for training in pharmacy. What is urgently required in China today is a college of pharmacy where young Chinese may receive a thorough training in all branches of pharmacy. We would take this opportunity of appealing to all Chinese pharmacists abroad to do what they can to have a college of pharmacy established in the not far distant future in this

country where their less fortunate brothers may have an opportunity of studying pharmacy in a well-equipped school and under qualified guidance.

Tsinanfu.—It is the intention of Mr. Pailing, the pharmacist at the Shantung Christian University Medical School, to establish a pharmacy school in Tsinanfu this fall. This pharmacy school will form a section of the college proper. Like ourselves, he has a long list of applicants who wish to study pharmacy and he should have no trouble in enrolling many students when the time for opening the school comes around.

Peking.—Or to give the city its new name under the Nationalist Government, *"Peping."*

During October and November, 1928, the Department of Health of this city decided that all medical practitioners in Peping should be registered in the Health Department; at the same time they decided that all pharmacists and drug store workers should have some form of registration under the Department of Health of the city. The Health Department requested the co-operation of the executive of the North China Pharmaceutical Society, and after many meetings it was decided to plan the opening of a school of pharmacy under the Department of Health where the elementary principles of pharmacy would be taught to apprentices in Chinese drug stores. Rooms in one of the disused public buildings were allotted to the N. C. P. S. for this purpose and all the pharmacies in Peping were requested to furnish material and apparatus for the school. Before the end of the year (1928) all the chemicals and drugs and necessary apparatus were supplied by the various pharmacies in Peping, free of charge. But, unfortunately, there has been some hitch in negotiations and this school for the training of apprentices has not yet opened its doors. We trust, however, that during this year (1929) something may be done to have this very necessary school opened. The teachers, who for the first year or two will all be voluntary, will be drawn from the qualified members of the N. C. P. S. The period of instruction planned will be for one year, and at the end of the year an examination will be given to all the students; those who pass will be given a certificate from the Department of Health.

So far as we know, this is the first instance in China of anything officially being done for the advancement of pharmacy in this country, and it is to be hoped that other large centres like Shanghai, Hankow,

etc., will copy the example set them by the very progressive Department of Health of Peping.

Pharmaceutical Appointments.—During the past year (1928) we have received quite a number of requests from institutions and retail pharmacies in different parts of China for qualified Chinese pharmacists who may be entrusted with the preparation of galenicals, tablets, etc., and it is interesting to note that higher salaries are now being offered men who possess the necessary qualifications. In one case a large mining organisation requested a qualified Chinese pharmacist to take charge of five of their dispensaries and the pharmacy attached to one of their large hospitals. They offered him free quarters and Mex. $125 per month (gold $65), which is quite a good salary in this part of the world.

New Customs Duties on Chemicals.—On February 1st this year the Nationalist Government revised all the customs schedules and from that date there has been an increased duty imposed on all imported chemicals and drugs. The new duties range from 2½ per cent. to 20 per cent. In the case of patent or proprietary medicines the new duty is something like 20 per cent. on the invoice value. This will naturally increase the selling price of all imported patent medicines in China.

Narcotics.—During the past three months the Peping Municipality Health Department has drawn up a set of new regulations regarding the importing, stocking and selling of narcotics in this city. The difficulty of purchasing such items as cocaine hydrochloride, morphine hydrochloride and codeine phosphate for bona fide use in the outpatient clinics of an hospital may best be illustrated by a recent shipment we received from abroad. The original order was sent away twenty-two months before we actually received the narcotics. The shipment was detained by the Chinese authorities for almost one year before they saw fit to release it. The inconvenience caused by this method of handling narcotic shipments can easily be imagined.

Ma Huang and Its Alkaloids.—It is interesting to note that during the past two years China has commenced exporting crude drugs. Ma Huang was exported abroad for the first time in 1926, and now there has sprung up a foreign market which is likely to increase from year to year.

The declared exports of Ma Huang to the United States are as follows:

1926..... 224.058 lbs.
1927..... 662.060 lbs.
1928..... 458.021 lbs.

The 1928 figure is to the end of July.

According to B. E. Read, the following quantities of Ephedrine were exported to the U. S. A. from this college:

1926..... 12.5 lbs.
1927..... 23.0 lbs.
1928..... 13.4 lbs.

SYNTHETIC AROMATIC CHEMICALS

By J. N. Taylor

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"MODERN CHEMISTRY has declared the world's independence of dyewoods from distant tropic forests, perfumes from closed valleys, resins from damp jungles, and medicines from rare herbs," says a recent bulletin from the Washington, D. C., headquarters of the National Geographic Society. "Independence has not been achieved entirely, but if all the flowers lost their perfume and colors, all the spices their pungence, and most fruits their flavors, chemists could closely imitate most of the lost factors synthetically." Furthermore, chemists have evolved pleasing colors and odors not found in nature.

The history of perfumes, it has been said, is in some degree the history of civilization. Known and used by the ancient Egyptians, employed in the temples of India and China and in the palaces of the Greeks and Romans—the adaptation of odoriferous substances to our twentieth century civilization is not unremarkable nor is the development of the industry furnishing them to be wondered at. While formerly the perfumer had available only materials of animal and vegetable origin, in recent years great advances have been made in the knowledge of and the manufacture of artificial products and these are finding increasing usefulness for a variety of purposes. These synthetics enter into the composition of a large number of articles such as flavoring extracts, toiletries, pharmaceuticals, insecti-

cides, disinfectants, deodorants, soaps, polishes and many other specialties requiring a distinctive flavor or odor to enhance their attractiveness or to cover a deficiency.

The synthetic aromatic chemical industry in the United States is one of great magnitude, employing many skilled workers and calling for large capital investments to maintain and further develop the intricate processes of this difficult field. The products of this branch of the organic chemical industry are not now arbitrarily restricted to cyclic compounds but include those of aliphatic origin as well. For want of a better name they are often termed "flavor and perfume materials" and since they are used in minute quantities, individually or in blends, their consumption when aggregating hundreds of thousands of pounds annually is indeed large.

Synthetic aromatic chemicals are employed primarily because of their pleasant odor or agreeable flavor and may be classified chemically as alcohols, ketones, aldehydes, acids and esters of both coal tar and non-coal tar origin. Among the alcohols may be mentioned phenyl-ethyl alcohol, one of the triumphs of synthetic perfume chemistry. It is an absolutely essential ingredient in all well made artificial attar of rose. Cinnamic alcohol, a natural constituent of storax and balsam of Peru, is now made synthetically and is most useful in compounding perfumes of the lilac and lily of the valley type. The terpineol of commerce is a mixture of at least three isomeric alcohols, the compound perfumes known under the names of muguet, syringol, lilacine and artificial gardenia being all based on this product. A number of aldehydes are prepared synthetically and are of considerable value in perfumery. Foremost of these, perhaps, is the so-called artificial oil of almonds which consists almost entirely of benzaldehyde, while another important synthetic aldehyde is salicylic aldehyde, an almost colorless oil having the characteristic odor of oil of meadowsweet. Phenyl acetic aldehyde is one of the indispensable constituents in artificial imitations of flower perfumes of the hyacinth, narcissus and jonquil type, and aubepine (anisic aldehyde) possesses the odor of hawthorn blossoms. Among the ketones may be mentioned acetophenone, found naturally in the essential oil of labdanum resin. This substance has a lasting and powerful sweet odor and is useful in soap perfumery. Esters are among the most important of the natural constituents of essential oils, and in many cases are the principal odor bearers. Included in this group are methyl salicylate, the artificial oil of wintergreen; methyl anthranilate, used to accentuate

the taste and odor of grape juice and to manufacture artificial oil of neroli; methyl benzoate, sold commercially under the name of niobe oil; amyl salicylate, the basic constituent of artificial orchid perfumes; and the esters of geraniol, linalool, and borneol. Borneol acetate is a commercial article used as an artificial substitute for pine needle oil.

In addition to the utility of these synthetic organic compounds as perfume bases and flavor materials they are also employed in many other ways. In the following list* are described some of the more important synthetic aromatic chemicals, finding employment in a variety of ways.

ALCOHOLS

AMYL ALCOHOL

CH_3. CH_3CH $(CH)_2$ OH. Colorless. Liquid. Sp. gr. 0.810. B. P. 130°C. Soluble in water, alcohol and ether. Uses—Amyl acetate and other amyl chemicals, various esters such as salicylic, valerianic, etc., general solvent, aromatic perfume esters, synthetic rubber, solvent for fats and oils, special varnishes, resins and waxes, laboratory reagent, gelatinizing agent in smokeless powder, artificial fruit syrups, intermediates and organic chemicals, amyl nitrite, hypnotics, nitrocellulose plastics.

BENZYL ALCOHOL

$C_6H_5CH_2OH$. Colorless. Liquid. Faint aromatic odor. Sp. gr. 1.043 (20°C). B. P. 204.7°C. Soluble in water, alcohol and ether. Uses—Intermediates, esters, organic chemicals, aeroplane dopes and varnishes, artificial perfume preparations.

BORNEOL (Borneo Camphor)

$C_{10}H_{17}OH$. White. Solid. Amorphous and Crystalline. Peppery odor. Sp. gr. 1.011. M. P. 203.4°C. B. P. 212°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Perfumes, pharmaceuticals, intermediates, organic chemical, synthetic camphor, borneolesters, in medicine, making celluloid.

BUTYL ALCOHOL (Butanol)

CH_3 $(CH)_3$ OH. Normal. Colorless. Liquid. Vinous odor. Sp. gr. 0.810 (20°C). B. P. 117°C. Soluble in water, alcohol and ether. Uses—Esters, butyric acid, butyl derivatives, butenes, high temperature extractions and alcoholic saponifications, dyestuffs, color bases, fat and oil solvent, fruit essences, gum solvent, artificial leather, leather coatings, paints, varnishes, japans, dopes, lacquers, vehicle in making bronze powders, per-

*The items described were selected from the "Drug and Chemical Guide Book," published by the "Haynes Publications, Inc.," 25 Spruce Street, New York.

fume preparations, artificial musk, solvent in making films and moving picture films, solvent in making celluloid and plastics, wax and resin solvent, in medicine.

ISOBUTYL ALCOHOL

$(CH_2)_2$ $CHCH_2OH$. Colorless. Liquid. Sp. gr. 0.806 (15°C). M. P. 108°C. B. P. 106.5°C. Soluble in water, alcohol and ether. Uses—Intermediates, organic chemicals, synthetic dyes, fruit essences, perfumes.

CINNAMIC ALCOHOL (Cinnamyl Alcohol, Styrone)

C_6H_5CH:CH. CH_2O. White. Solid. Crystalline. Sp. gr. 1.0397 (35°C). M. P. 33°C. B. P. 254-7°C. Soluble in alcohol and ether. Uses—perfumes, bromostyrol, intermediates, in medicine.

CITRONELLOL

$C_{10}H_{20}O$. Colorless. Liquid. Agreeable odor. Sp. gr. 0.856 (8°C). B. P. 118°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—artificial rose oil, perfuming soaps, cosmetics, perfumes and toilet preparations.

GERANIOL

$C_9H_{15}CH_2OH$. Pale yellow. Liquid. Geranium-like odor. Sp. gr. 0.8812 (16°C). M. P. 15°C. B. P. 230°C. Soluble in alcohol and ether. Uses—Perfume, cosmetics, perfume preparations, soaps, toilet preparations, artificial geranium odor.

LINALOOL

$C_{10}H_{17}OH$. Colorless. Liquid. Odor similar to Bergamot oil and French Lavender. Sp. gr. 0.873. B. P. 195 to 199°C. Soluble in alcohol and ether. Uses—Perfume preparations, soaps.

PHENYL ETHYL ALCOHOL

$C_6H_5CH_2CH_2OH$. Colorless. Liquid. Sp. gr. 1.0235 (15°C). B. P. 212°C. Soluble in alcohol and ether. Slightly soluble in water. Uses—Perfume preparations.

PHENYLPROPYL ALCOHOL (Secondary)

C_6H_5CH (OH) C_2H_5. Colorless. Liquid. Sp. gr. 0.994 (23°C). B. P. 212°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Perfume preparations and synthetic perfumes.

RHODINOL

Name for commercial geraniol, containing oils of rose, geranium and citronella. Uses—Perfume preparations, geranium and rose oil compositions, perfuming soaps, cosmetics, toilet articles, adulterating rose oil.

TERPINEOL

$C_{10}H_{17}OH$. Colorless. Liquid. Lilac odor. Sp. gr. alpha 0.9357. beta 0.923. M. P. alpha 35°C. beta 32°C. Gamma 69-70°C. B. P. alpha 218°. beta 210°C. Soluble in alcohol and ether. Uses—Perfume compositions, artificial lilac perfume, cosmetics and toilet articles, perfuming soaps.

ALDEHYDES

ANISIC ALDEHYDE (Aubepine)

C_6H_4 ($O.CH_3$) CHO. Colorless. Liquid. Aromatic odor. Sp. gr. 1.126. M. P. 2.1°C. B. P. 248°C. Soluble in alcohol and ether. Uses—Synthetic perfumes, dyes, liqueurs and extracts, silvering mirrors.

BENZALDEHYDE (Artificial Essential Oil of Almonds)

C_6H_5CHO. Colorless. Liquid. Fragrant odor. Sp. gr. 1.05. M. P. 13.5°C. B. P. 179.5°C. Soluble in alcohol and ether. U.S.P. Dose, ½ minim. Uses—Intermediates, synthetic pharmaceuticals, benzoic acid, cinnamic aldehyde, triphenylmethane dyes, malachite green, acridine dyes, flavoring compounds, baked products, substitute for natural oil of bitter almonds, perfumes, toilet preparations, photographical chemicals, soap ingredient, stimulating expectorant in medicine.

BUTYL ALDEHYDE (Butyric Aldehyde)

CH_3 $(CH_2)_2CHO$. Liquid. Sp. gr. 0.8170. B. P. 73-74°C. Soluble in water, alcohol and ether. Uses—Synthetic perfumes, organic chemicals, perfume preparations.

CINNAMIC ALDEHYDE (Cinnamyl Aldehyde)

$C_6H_5CH:CH.$ CHO. Yellow. Liquid. Cinnamon odor. Sp. gr. 1.129. M. P. —8°C. B. P. 248°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—artificial cinnamon flavor, food extracts.

CITRAL

$C_9H_{15}CHO$. Colorless. Liquid. Sp. gr. 0.897. B. P. 228-9°C. Soluble in alcohol and ether. Uses—artificial violet essence, food flavor.

CITRONELLAL

C_9H_{17} CHO. Colorless. Liquid. Characteristic odor. Sp. gr. 0.854 (17°C). B. P. 205-8°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—perfuming soaps, cosmetics, toilet articles, making citronellol.

HYDROXYCITRONELLAL

Uses—Perfume fixative, artificial lily odor.

HELIOTROPIN (Piperonal)

C_6H_3 (CH_2OO) COH. White. Solid. Crystalline. M. P. 37°C. B. P. 263°C. Soluble in alcohol and ether. Slightly soluble in water. Uses—Perfume and cosmetic preparations, soaps, in medicine.

ISOVALERIC ALDEHYDE

$(CH_3)_2CHCH_2CHO$. Colorless. Liquid. Sp. Gr. 0.804. B. P. 92°C. Soluble in alcohol and ether. Uses—flavoring extracts, flavoring food preparations, beverages, sweetmeats, candies, perfume preparations, cosmetics, toilet articles.

PHENYL ACETALDEHYDE (Phenyl Acetic Aldehyde)

$C_6H_5CH_2CHO$. Colorless. Liquid. Strong hyacinth odor. Sp. gr. 1.032. M. P. less than 10°C. B. P. 193-194°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Perfumes and perfume preparations, artificial essence of hyacinth.

VANILLIN

$C_6H_3OHOCH_3CHO$. Colorless. Solid. Crystalline. Pleasant aroma. M. P. 80-81°C. B. P. 285°C. Soluble in water, alcohol and ether. U.S.P. Dose, ½ gr. Uses—Flavoring extracts, beverages, liqueurs, baked products, confectionery, candies, sweetmeats and food products, perfume preparations, cosmetics and toilet articles, stomachic, motor stimulant, and flavoring agent in medicine.

KETONES

ACETOPHENONE (Hypnone)

$C_6H_5COCH_3$. White. Solid. Crystalline. Sp. gr. 1.030 (20°C). M. P. 20.5°C. B. P. 202°C. Insoluble in water. Soluble in alcohol, ether, choloroform and benzine. Uses—synthetic perfume bases, somnifacient in medicine.

BENZOPHENONE (Diphenylketone)

$(C_6H_5)_2CO$. Colorless. Solid. Crystalline. Sp. gr. 1.098 (50°C). M. P. 48°C. B. P. 306°C. Soluble in alcohol and ether. Uses—Intermediates, synthetic drugs and perfumes, synthetic dyes.

BENZYLIDENE ACETONE (Acetocinnamone, Benzalacetone)

$C_6H_5:CHCHCOCH_3$. Colorless. Solid. Crystalline. Sp. gr. 0.9947. M. P. 42°C. Soluble in alcohol, ether, benzene, and chloroform. Uses—Perfume compositions, artificial sweet pea essence, eau de Cologne, jonquille and lavender essences.

CARVOL (Carvone)

$C_{10}H_{14}O$. Yellowish or colorless. Liquid. Sp. gr. 0.960. B. P. 230°C. Soluble in alcohol, ether and chloroform. Uses—Flavoring beverages, liqueurs, dental preparations, chewing gum, cosmetics and perfume preparations, toilet soaps, pharmaceutical preparations in medicine.

IONONE (Artificial Violet)

$C_{13}H_{20}O$. Colorless. Liquid. Violet odor. Sp. gr. 0.934. B. P. 120.6°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Artificial perfume preparations, cosmetics, soaps.

IONONE, BETA

$C_{13}H_{20}O$. Colorless. Liquid. Sp. gr. 0.949. B. P. 134.6°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Artificial perfume preparations.

IONONE, METHYL

$C_{14}H_{22}O$. Liquid. Ionone odor. B. P. 155-160°C. Soluble in alcohol. Uses—Artificial perfume preparations.

METHYL HEPTONONE

$(CH_3)_2C:C\ (CH_2)_2\ COCH_3$. Colorless. Liquid. Sp. gr. 0.855. B. P. 173.4°C. Soluble in alcohol and ether. Uses—Perfume in making soaps, perfume preparations, cosmetics, toilet preparations.

ACIDS

ACID ANTHRANILIC (Acid, Orthoamino Benzoic)

$C_6H_4\ (NH_2)\ (COOH)$. Colorless. Solid. Crystalline. M. P. 145°C. Soluble in water, alcohol and ether. Uses—pharmaceuticals, thiosalicylic acid, azo dyes, indigo, vat dyes, methyl anthranilate.

ACID BENZOIC

C_6H_5COOH. Colorless. Solid. Crystalline. Sp. gr. 1.34. M. P. 121.4°C. B. P. 249.0°C. Soluble in alcohol and ether; slightly soluble in water. U.S.P. Dose 15gr. Uses—benzoates and derivatives, pharmaceuticals, aniline blue, aniline dyes, anthraquinone dyes, food preservative, toilet preparations, alkylbenzoates, perfume bases, mordant in calico printing, curing tobacco, stimulant and antibactericide in medicine.

ACID BUTYRIC

$CH_3\ (CH_2)_2\ COOH$. Colorless. Liquid. Rancid odor. Sp. gr. 0.9599. M. P. 3.12°C. B. P. 162.3°C. Soluble in water, alcohol and ether. Uses—esters and salts, flavoring agent, preparing essences, making butter, deliming hides, tanning agent, varnishes, synthetic perfumes, disinfectant, stimulant in medicine.

ACID, CAPRYLIC (Acid, Octylic)

$C_7H_{15}COOH$. Colorless. Liquid. Sp. gr. 0.9185. M. P. 17°C. B. P. 235-237°C. Soluble in water, ether and alcohol. Uses—Intermediates, organic chemicals, synthetic perfumes.

ACID CAPROIC

$C_5H_{11}COOH$. Colorless. Liquid. Odor of Limburger cheese. Sp. gr. 0.9220 (20°C). M. P. 5.2°C. B. P. 205°C. Soluble in alcohol and ether. Uses—fruit essences, laboratory reagent.

ACID CINNAMIC

$C_6H_5CHCHCOOH$. White. Solid. Crystalline. Sp. gr. 1.2475. M. P. 133°C. B. P. 200°C. Soluble in alcohol and ether; slightly soluble in water. Uses—intermediates, synthetic perfumes, bromostyrol, tuberculosis treatment, in medicine.

ACID PHENYLACETIC

$C_6H_5CH_2COOH$. White. Solid. Crystalline. Sp. gr. 1.0809. M. P. 76°C. B. P. 262°C. Soluble in alcohol and ether; insoluble in water. Uses—Perfume esters and derivatives, perfumes, in medicine.

ACID PROPIONIC

CH_3CH_2COOH. Colorless. Liquid. Sp. gr. 0.987. M. P. 19°C. B. P. —140.7°C. Soluble in water, alcohol and ether. Uses—Propionates, artificial fruit flavors, anethol, perfume esters.

ESTERS

AMYL ACETATE (Banana Oil)

$CH_3CO_2C_5H_{11}$. Colorless. Liquid. Banana odor. Sp. gr. 0.8659 (25°C). M. P. 75°C. B. P. 148°. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Solvent in making nitrocellulose, gun-cotton, smokeless powder, fruit flavors, soft drinks, food preparations, confectionery, making artificial leather, artificial pearls, combustible in standard photometric lamp, fireproofing and waterproofing compositions, lacquers, waterproofed varnishes, bronzing liquids, perfume solvent, making celluloid, collodion, photo-engraving, soap solvent, solvent in making rayons, dyeing, printing and finishing textiles, linoleum and oilcloth, photographic films.

AMYL BUTYRATE

$C_4H_7O_2C_5H_{11}$. Colorless. Liquid. Sp. gr. 0.8592. B. P. 153-155°C. Soluble in alcohol and ether. Slightly soluble in water. Uses—Intermediates and organic chemicals, flavoring extracts and liqueurs.

AMYL FORMATE

$CH_2OC_5H_{11}$. Colorless. Liquid. Sp. gr. 0.9018. B. P. 130.4°C. Slightly soluble in water. Soluble in alcohol and ether. Uses—Flavoring compounds, fruit syrups.

AMYL PHENYLACETATE

Uses—Perfumes, toilet preparations.

AMYL SALICYLATE

$C_7H_5O_3:C_5H_{11}$. Colorless to yellow. Liquid. Sp. gr. 1.045. B. P. 268-273°C. Soluble in alcohol and ether. Uses—Flavoring extracts, in medicine.

AMYL VALERATE (Apple Essence, Apple Oil)

$C_4H_9CO_2C_5H_{11}$. Colorless. Liquid. Sp. gr. 0.8812 (0°C). M. P. 75°. B. P. 203.7°C. Soluble in alcohol and ether. Slightly soluble in water. Uses—Flavoring extracts, in medicine.

BENZYL ACETATE

$CH_3COOCH_2C_6H_5$. Colorless. Liquid. Sp. gr. 1.057 (16°C). B. P. 206°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Fruit essences, solvent in aeroplane dopes, perfumes, toilet preparations and cosmetics, fine toilet soaps.

BENZYL CHLORIDE

$C_6H_5CH_2Cl$. Colorless. Liquid. Aromatic odor. Sp. gr. 1.103 (18°C). M. P. 41.2°C. B. P. 176-9°C. Soluble in alcohol and ether. Uses—Intermediates and organic chemicals, benzaldehyde, benzoic acid, esters, salts, intermediates, perfume esters, synthetic drugs, basic dyes, photographic developers, artificial resins in medicine.

BENZYL FORMATE

$C_6H_5CH_2OCHO$. Colorless. Liquid. Fruity odor. Sp. gr. 1.081. B. P. 202-3°C. Soluble in alcohol and ether. Uses—Artificial perfumes, artificial perfume preparations.

BORNYL ACETATE (Borneol Acetate)

$CH_3COOC_{10}H_{17}$. Colorless. Solid. Amorphous. M. P. 29°C. B. P. 223°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Cosmetics.

BUTYL ACETATE

$CH_3COOC_4H_9$. Colorless. Liquid. Sp. gr. 0.8882 (20°C). B. P. 125°C. Soluble in alcohol and ether. Slightly soluble in water. Uses—Fruit essences (artificial banana flavor).

BUTYL PROPIONATE

$C_3H_5O_2C_3H_7$. Liquid. Sp. gr. 0.8885 (13°C). B. P. 122.2°C. Soluble in water, alcohol and ether. Uses—Synthetic perfume preparations, cosmetics.

CITRONELLYL ACETATE

$C_{10}H_{19}$ $OOCCH_3$. Liquid. Sp. gr. 0.8928 (17.5°C). B. P. 119-121°C. Soluble in alcohol. Uses—artificial rose and carnation ottos, perfume, cosmetics and toilet articles.

DIETHYLPHTHALATE

C_3H_4 $(COOC_2H_5)_2$. Solid. Crystalline. Sp. gr. 1.122. B. P. 296.1°C. Soluble in alcohol and ether. Uses—solvent and fixative for perfumes, ingredient of perfumes, substitute for camphor in celluloid, solvent for cellulose acetate, oiling textile fabrics.

ETHER, OENANTHIC (Rum Ether, Cognac Oil)

CH_2 $(CH_2)_5$ $COOH$. C_2H_5. Colorless. Liquid. Sp. gr. 0.874 (24°C). B. P. 189.3°C. Soluble in alcohol and ether. Uses—essential oils, antispasmodic and sedative in medicine.

ETHYL ACETATE (Acetic Ether, Vinegar Naphtha)

$CH_3COOC_2H_5$. Colorless. Liquid. Fragrant odor. Sp. gr. 0.9003. M. P. —82.4°C. B. P. 77.15°C. Soluble in water, alcohol and ether. N. F. Dose, 15 minims. Uses—solvent for pyroxylin and nitrocellulose plastics, acetoacetic ester, synthetic dyes, drugs and perfumes, intermediate chemicals, solvent of nitrocellulose in artificial leather manufacture, artificial fruit flavors, bonbons and confections, solvent in making smokeless powder, artificial horsehair bristles for brushes, solvent in nitrocellulose var-

nishes, paints and dopes, solvent in perfumes, photographic films and plates, rayon, stimulant, antispasmodic and solvent in medicine.

ETHYL ACETOACETATE (Diacetic Ether)

$CH_3COCH_2COOC_2H_5$. Colorless. Liquid. Sp. gr. 1.0212. M. P. —80°C. B. P. 180-1°C. Soluble in alcohol and slightly soluble in water. Uses—Antipyrine, intermediates, ionone and other synthetic perfumes.

ETHYL BENZOATE (Benzoic Ether)

$C_6H_5COOC_2H_5$. Colorless. Liquid. Aromatic odor. Sp. gr. 1.0509. M. P. —32.7°C. B. P. 212.9°C. Soluble in alcohol and ether. Slightly soluble in hot water. Uses—flavoring extracts, perfumes, cosmetics, pompades, "Essence of Niobe" and "Peau d'Espagne."

ETHYL BUTYRATE, see Ether Butyric

$C_3H_7COOC_2H_5$. Colorless. Liquid. Pineapple odor. Sp. gr. 0.886. M. P. —93.3°C. B. P. 119.9°C. Soluble in alcohol and ether. Slightly soluble in water. Uses—flavoring extracts, artificial pineapple flavor, fruit candy, perfumes, cosmetics and toilet articles.

ETHYL CINNAMATE (Cinnamic Ether)

$C_6H_5C_2H_2COOC_2H_5$. Colorless. Liquid. Strawberry odor. Sp. gr. 1.0546. M. P. 12°C. B. P. 271°C. Soluble in alcohol and ether. Uses—fixative in making perfumes and cosmetics, fine colognes, oriental bouquets.

ETHYL FORMATE (Formic Ether)

$HCOO.C_2H_5$. Colorless. Liquid. Peach-kernel odor. Sp. gr. 0.917. M. P. —80°C. B. P. 54.40°C. Soluble in water, alcohol and ether. Uses —artificial rum and arak, flavoring extracts, in medicine.

ETHYL NITRATE (Nitric Ether)

$C_2H_5NO_3$. Colorless. Liquid. Sp. gr. 1.116. M. P. 112°C. Soluble in alcohol and ether. Uses cals, intermediates,

ETHYL OXALATE

Uses—perfume preparations.

ETHYL PROPIONATE (Propionic Ether)

$C_2H_5COOC_2H_5$. Colorless. Liquid. Sp. gr. 0.819 (20°C.). B. P. 135°C. Soluble in alcohol. Uses—ingredient of soft drinks, fruit syrups.

ETHYL SALICYLATE (Salicylic Ether)

$HO\ C_6H_4\ COO\ C_2H_5$. Colorless. Liquid. Sp. gr. 1.135. M. P. 1.3°C. B. P. 231°C. Soluble in alcohol and ether. Uses—synthetic cassia, perfumes, cosmetics.

ETHYL VALERATE (Valerianic Ether)

$C_5H_9O_2C_2H_5$. Colorless. Liquid. Fruity odor. Sp. gr. 0.877 (20°C). B. P. 144.5°C. Soluble in alcohol and ether. Uses—artificial essence of cherry, currants, strawberry, intermediates and organic chemicals, artificial cognacs and toilet water.

GERANYL ACETATE (Geraniol Acetate)

$C_9H_{14}CH_2OHCH_3COO$. Colorless. Liquid. Sp. gr. 0.915. Decomposes at 242.5°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Artificial rose perfume, toilet preparations and cosmetics, fine toilet soaps.

GERANYL BUTYRATE (Geraniol Butyrate)

$C_{14}H_{24}O_2$. Liquid. Sp. gr. 0.966 (15°C). B. P. 171°C. Uses—Artificial rose perfumes, perfume in toilet preparations, cosmetics, and fine soaps.

GERANYL FORMATE (Geraniol Formate)

$C_{14}H_{18}O_2$. Liquid. Sp. gr. 0.909. B. P. 98°C. Uses—Artificial orange blosom oil, perfume in toilet preparations, cosmetics and fine soaps.

LINALYL ACETATE (Bergamoil)

$C_{10}H_{17}C_2H_3O_2$. Colorless. Liquid. Bergamot odor. Sp. gr. 0.913 (15°C). B. P. 108-110°C. Soluble in alcohol and ether. Uses—Bergamot extracts, cosmetics, perfume preparations and toilet articles.

LINALYL BENZOATE

Uses—Perfume preparations, cosmetics.

METHYL ANTHRANILATE (Neroli Oil)

H_2N. C_6H_4. $COOCH_3$. Colorless. Solid. Crystalline. Sp. gr. 1.168 (15°C). M. P. 24.5°C. B. P. 132°C. Soluble in alcohol and ether. Slightly soluble in water. Uses—Perfume preparations, cosmetics, flavoring extracts and flavoring agent in confectionery, candies, etc., artificial neroli flavor and perfume.

METHYL BENZOATE (Oil Niobe)

$C_6H_5COO_2CH_3$. Colorless. Liquid. Sp. gr. 1.094. M. P. 12.3°C. B. P. 199°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Artificial Niobe oil, perfume in perfume preparations and cosmetics.

METHYL CHLORIDE

CH_3Cl. Colorless. Gas. Ethereal odor. Sp. gr. 0.9197 (18°C). M. P. 91.5°C. B. P. 23.73°C. Soluble in water and alcohol. Uses—Intermediates and organic chemicals, active refrigerant, solvent and extracting medium for essential oils, perfume preparations, thermometers, airplane radiators, general and local anaesthetic in medicine.

METHYL CINNAMATE

C_6H_5CH. $CHCOOCH_3$. Colorless. Solid. Crystalline. Strawberry-like odor. Sp. gr. 1.0415. M. P. 36°C. B. P. 259.6°C. Soluble in alcohol and ether. Uses—Perfume ingredient, flavoring extracts, flavoring agent in candies and confectionery, sweetmeats, etc., cosmetics and toilet preparations, Cologne water.

METHYL SALICYLATE (Synthetic Oil Wintergreen)

$OHC_6H_4COOCH_3$. Colorless. Liquid. Wintergreen odor. Sp. gr. 1.1850. M. P. 8.3°C. B. P. 222.2°C. Soluble in alcohol and ether. Slightly soluble in water. U.S.P. Dose, 12 minims. Uses—Artificial oil of wintergreen, flavoring extracts, flavoring agent in making sweetmeats, candies, confectionery and various food products, liniments, antiseptic, analgesic, carminative and flavoring agent in medicine.

NEROLIN (Methyl-Beta-Naphtholate, Yara Yara)

$C_{10}H_7OCH_3$. White. Solid. Crystalline. M. P. 72°C. B. P. 274°C. Soluble in alcohol and ether. Uses—Perfume preparations, cosmetics, pomades, toilet preparations, cheap soaps.

PHENYLETHYL BUTYRATE

C_6H_5. CH_2 CH_2OOC. CH_2. CH_2CH_3. Liquid. Sp. gr. 1.05. Soluble in alcohol. Uses—Perfume preparations.

PHENYLETHYL FORMATE

C_6H_5. C_2H_4OOC. H. Liquid. Soluble in alcohol. Uses—Perfume preparations.

PHENYLETHYL PROPIONATE

C_6H_5 $C_2H_4OOCCH_2CH_3$. Liquid. Sp. gr. 1.0343 (0°C). B. P. 232°C. Soluble in alcohol. Uses—Perfume preparations.

PHENYLETHYL VALERATE

C_6H_5. C_2H_4 OOC $(CH_2)_3$. CH_3. Liquid. Soluble in alcohol. Uses—Perfume preparations.

TERPENYL ACETATE

$C_{10}H_{17}COOCH_3$. Colorless. Liquid. Characteristic odor. Sp. gr. 0.9705. M. P. 50°C. B. P. 220°C. Soluble in alcohol and ether. Uses—Perfume preparations, cosmetics and toilet articles, adulterating lavender oil.

PHENOLS

ANETHOL (Anise Camphor)

$C_3H_5C_6H_4$ (OCH_3). Colorless. Solid. Crystalline. Natural. Sp. gr. 0.9936. M. P. 21-22°C. B. P. 232-4°C. Soluble in alcohol and ether. Very slightly soluble in water. N.F. Dose, 3 minims. Uses—Flavoring compounds, cosmetics and toilet articles, sensitizer in color photography, carminative and expectorant in medicine.

EUGENOL (Synthetic Oil of Cloves, Para-oxy-metamethoxyallylbenzene)

$C_3H_5C_6H_3(OH)$ OCH_3. Colorless or yellow. Liquid. Spicy odor. Sp. gr. 1.063 (18°C). B. P. 253°C. Soluble in alcohol and ether. Very slightly soluble in water. U.S.P. Dose, 3 minims. Uses—carnation perfumes, essential oil substitutes, cosmetics, isoeugenol and vanillin, antiseptic and local anaesthetic in medicine.

EUCALYPTOL (Cineol, Cajeputol)

$C_{10}H_{18}O$. Colorless. Liquid. Camphor-like odor. Sp. gr. 0.9267. M. P. —1 to 3°C. B. P. 176°C. Soluble in alcohol and ether. U.S.P. Dose, 5 minims. Uses—ingredient of cosmetics, soaps, perfume preparations, dental preparations, antispasmodic, antiseptic, antiperiodic and expectorant in medicine.

ISO-EUGENOL

C_3H_5. C_6H_3 (OCH_3) OH. Colorless. Liquid. Sp. gr. 1.091 (15°C). M. P. 10°C. B. P. 267.5°C. Soluble in alcohol and ether. Slightly soluble in water. Uses—Vanillin, base for artificial carnation perfumes, oriental ottos, toilet soaps.

SAFROL

$C_3H_5C_6H_3O_2CH_3$. Colorless or pale yellow. Liquid sassafras odor. Sp. gr. 1.0960 (15°C). M. P. 11°C. B. P. 233°C. Soluble in alcohol and ether. Uses—Perfume preparations, perfuming soaps, artificial oil of sassafras, heliotropin and piperonal, antiseptic in medicine.

ISOSAFROL

$CH_3CH : CHC_6H_3 : O_2 : CH_2$. Liquid. M. P. about 18°C. B. P. 253-4°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Piperonal, artificial perfume preparations.

IMIDO COMPOUNDS

INDOL (Ketol)

C_6H_4 (CH.NH) CH. Colorless to yellowish. Solid. Crystalline. Intense fecal odor. M. P. 52°C. B. P. 254°C. Soluble in alcohol, ether and hot water. Uses—Synthetic jasmine and neroli oils, reagent in chemical processes, in medicine.

MUSK AMBRETTE

C_6 (CH_3) (NO_2)$_2$ (OCH_3). C (CH_3)$_3$. M. P. 85°C. Uses—Fixing and blending perfume preparations.

MUSK KETONE

C_6 (CH_3) (NO_2)$_2$ ($COCH_3$) ($C(CH_3)_3$). M. P. 136°C. Uses—Artificial perfume preparations.

MUSK XYLENE (Musk Xylol)

C_6 (NO_2)$_3$ (CH_3)$_2$ $C(CH_3)_3$. M. P. 113°C. Uses—Perfume preparations, cosmetics and toilet preparations, toilet soaps, shampoo powders.

SKATOL

C_9H_9H. Solid. Crystalline. M. P. 95°C. B. P. 265.6°C. Soluble in alcohol and ligroin. Slightly soluble in water. Uses—Fixing floral ottos in perfumery.

OTHER SYNTHETIC AROMATICS

BETA-METHYLANTHRAQUINONE

Uses—Intermediates, synthetic drugs and perfumes, synthetic dyes.

BROMOSTYROL

$C_2H_5CH : CHBr$. Liquid. Sp. gr. 1.4289 (19°C). M. P. 7°C. B. P. 220°C. Insoluble in water. Soluble in alcohol and ether. Uses—Perfume, ingredient, perfuming soap.

COUMARIN (Coumarin, Tonka Bean Camphor)

$C_9H_6O_2$. Colorless. Solid. Crystalline. Sp. gr. 0.9207. M. P. 67°C. B. P. 290°C. Soluble in alcohol and ether. Slightly soluble in water. N.F. Uses—flavoring extracts, perfume fixative, flavoring foods, confectionery, flavoring agent in medicine.

DIPHENYLOXIDE

$(C_6H_5)_2O$. Colorless. Solid. Crystalline. Sp. gr. 1.0728. M. P. 27°C. B. P. 259°C. Soluble in alcohol and ether. Insoluble in water. Uses—intermediates and organic chemicals, synthetic dye, drugs and perfumes, perfume in cosmetics and toilet soaps.

ETHYL BROMIDE (Bromic Ether, Monobromoethane)

C_2H_5Br. Colorless. Liquid. Sp. gr. 1.450. M. P. —115.5°C. B. P. 38.4°C. Soluble in alcohol and ether. Sparingly soluble in water. Uses —intermediates, organic chemicals.

ETHYL IODIDE (Monoiodoethane)

CH_3CH_2I. Colorless. Liquid. Sp. gr. 1.9228. M. P. —111°C. B. P. 72°C. Soluble in ether and alcohol and slightly soluble in water. Uses—Intermediates, perfumes, inhalant in medicine.

ETHYLENE MONOCHLORIDE (Monochlorinated Dutch Liquor, Vinyl Trichloride)

CH_2ClCH_2Cl. Colorless. Liquid. Sp. gr. 1.458. B. P. 114°C. Soluble in alcohol and ether. Uses—Organic chemicals, intermediates, synthetic dyes, drugs and perfumes, anaesthetic in medicine.

METHYL HEPTINE CARBONATE

$CH_3 (CH_2)_4 . C : COOCH_3$. B. P. 105-109°C. Uses—Violet perfumes, cosmetics and toilet preparations.

NITROBENZENE (Oil Mirbane)

$C_6H_5NO_2$. Yellow. Solid or liquid. Odor of bitter almonds. Sp. gr. 1.19867 (25°C). M. P. 8.70°C. B. P. 210.85°C. Soluble in alcohol and ether. Very slightly soluble in water. Uses—Aniline, azobenzene, benzidine, quinaldin, quinoline, metanilic acid, various intermediates and organic chemicals, synthetic dyestuffs of azo, nigrosine, aniline, fuchsine and other groups, tetranitroaniline, and other high explosives, artificial oil of almonds in perfumery, cosmetics and toilet preparations, dust preventatives, polishes, greases, glues and cements, soaps.

United States Production and Imports

United States production of coal tar flavor and perfume materials is located mainly in the East, although two of the establishments reporting in 1927 were in Ohio. The States of New Jersey and New York are the principal producing States, sharing the honors about equally. In the table below are given production data for the past decade of synthetic aromatics derived from coal tar and finding use as flavor and perfume materials. While a decrease is observed in total production during 1927 of flavor and perfume materials of coal tar origin, a 4 per cent. increase in poundage is noted in perfume materials over the preceding year.

TABLE I

PRODUCTION OF COAL-TAR FLAVOR AND PERFUME MATERIALS, 1918-1927

Year	Flavors	Perfumes	Total
1918	458,256	116,263	574,519
1919	610,825	41,419	652,244
1920	166,884	99,740	266,624
1921	901,245	119,335	1,020,580
1922	1,215,668	793,148	2,008,816
1923	1,458,024	1,365,449	2,823,473
1924	1,750,555	1,895,267	3,645,822
1925	2,207,102	2,335,024	4,542,126
1926	2,857,913	1,922,666	4,780,579
1927	2,205,472	1,998,987	4,204,459

Imports of synthetic aromatics originate principally in France, Germany, the Netherlands and Switzerland, smaller shipments to the United States being made from England, Italy and Canada. Incoming shipments of many of these aromatic chemicals have increased in the past few years as will be noted in Table II. In addition to the principal aromatics noted in the table, there were brought into the United States during 1928, according to preliminary estimates, 2500 pounds of cinnamic alcohol, 1000 pounds of geranyl acetate, over 12,000 pounds of linalyl acetate and 12,000 pounds of oenanthol.

A comparison of production and imports of synthetic aromatics is shown in the following tabulation, which while not complete, affords an idea as to the relative amounts of the more important ones manufactured in the United States and importations.

TABLE II

PRODUCTION OF SYNTHETIC AROMATICS COMPARED WITH IMPORTS

Item	1926 Production Pounds	1926 Imports Pounds	1927 Production Pounds	1927 Imports Pounds
Acetophenone	1,362	1,113	2,145	536
Amyl salicylate	13,789	1,898	16,959	1,949
Anisic aldehyde	5,415	1,454	.....	1,666
Benzyl acetate	39,473	14,400	60,442	24,510
Benzyl alcohol	35,441	4,032	48,902	3,365
Benzyl benzoate	28,009	8,408	33,094	6,239
Coumarin	146,640	2,440	112,571	3,377
Diethyl phthalate	1,044,218	2,600	983,894	511
Diphenyl oxide	58,042	1,500	(1)	2,294
Ethyl acetate	[2] 43,661,465	855	[2] 49,203,156	3,748
Geranyl acetate	2,995	1,679	1,204	1,322
Heliotropin	22,764	3,811	(1)	4,818
Isobutyl benzoate	.....	440	848	500
Linalyl acetate	.....	5,485	487	11,038
Methyl acetophenone	356	559	959	523
Methyl phenylacetate	577	257	4,651	1,502
Phenyl ethyl acetate	.....	108	972	182
Terpineol	235,331	18,256	(1)	139,019
Terpinyl acetate	15,262	9,850	11,287	17,606
Vanillin	357,300	305	301,251	3,795

[1] Less than 1926. [2] 85 per cent.

TABLE III

IMPORTS INTO THE UNITED STATES OF PRINCIPAL AROMATICS, ENTERED FOR CONSUMPTION

1924-1928

Item	Amount in Pounds 1924	1925	1926	1927	1928*
Acetophenone	757	813	1,113	536	450
Ambrogene	....	1,102	6,458	9,676	14,600
Amylsalicylate	1,192	1,708	1,898	1,949	1,895
Anisic aldehyde	552	581	1,454	1,666	1,750
Benzophenone	257	777	547	425	90
Benzyl acetate	11,427	13,596	14,400	24,510	14,230
Benzyl alcohol	3,642	3,465	4,032	3,365	1,612
Benzyl benzoate	4,053	10,349	8,408	6,239	6,750
Benzyl cinnamate	....	20	38	6	45
Benzyl salicylate	....	254	169	592	335

*Preliminary.

Item	Amount in Pounds				
	1924	1925	1926	1927	1928*
Bromostyrol	246	95	373	928	300
Butylketone	....	1,186	9,407	882	3,527
Butylxylene	....	4,244	7,285	13,429	3,331
Cinnamic aldehyde	1,362	4,333	12,674	3,666	6,161
Coumarin	313	1,083	2,440	3,377	6,036
Diethyl phthalate	5,900	3,254	2,600	511	47
Diphenyloxide	103	723	1,500	2,294	2,869
Ethylanthranilate	3	8	135	43	0
Ethyl cinnamate	105	164	193	237	224
Heliotropine	3,180	3,116	3,811	4,814	4,828
Indol	18	40	99	118	269
Isobutyl phenyl acetate	3	75	415	51	0
Methyl acetophenone	333	964	559	523	506
Methyl anthranilate	2,689	5,009	8,222	17,826	6,735
Methyl cinnamate	113	137	632	1,352	3,001
Muskambrette	8,722	12,674	10,685	1,542	2,308
Musk ketone	3,973	5,226	4,844	1,530	2,220
Musk xylene	3,948	22,913	13,895	3,847	8,026
Nerolin	875	640	1,910	582	1,460
Phenylacetic acid	443	743	1,081	3,224	1,051
Phenylacetic aldehyde	1,545	2,288	2,436	3,563	2,735
Phenylacetic ethyl acetate	86	233	108	182	68
Phenylacetic ethyl alcohol	5,584	13,996	13,178	31,302	27,931
Phenylacetic ethyl propionate	75	137	71	50	10
Phenylacetic propyl alcohol	16	38	162	111	30
Phenylacetic propyl aldehyde	64	5	5	76	6
Terpineol	....	....	17,795	102,801	139,261
Vanillin	187	316	305	3,795	15,282
Yara yara (b-naphthol methyl ether)	640	145	1,069	697	530

*Preliminary.

The needs for aromatic synthetics by non-producing countries, and facts and figures showing what is being done by producing countries to supply such requirements, are described in a series of special circulars now being issued by the Chemical Division of the Bureau of Foreign and Domestic Commerce. The first in the series, distributed as Special Circular 220, entitled "British Trade in Synthetic Perfume Materials" by Trade Commissioner Homer S. Fox, has already been published. "Rumanian Trade in Synthetic Aromatics" by Commercial Attaché Sproull Fouché, is now ready for distribution. Other circulars are in course of preparation. Manufacturers, importers and exporters who wish to receive the series should signify their desire to the Chemical Division at Washington, D. C.

THE GRAND YOUNG VETERAN OF AMERICAN PHARMACY*

By E. G. Eberle

I AM DELEGATED to bring the greetings of the American Pharmaceutical Association and its congratulations to its veteran ex-president and birthday celebrant of this day and wish for him many more years of health and happiness. I esteem it a privilege and honor to have the opportunity of being with you to honor one whom I have regarded highly as pharmacist and friend for many years—one of America's outstanding scientists, one who has achieved greatness in research, as an author and founder of, in many respects, the foremost library of its kind in the world.

Dr. John Uri Lloyd

It has been said by another that "Back of every accomplishment there is a human being. The mere narration of results achieved makes history, but the most interesting phase of history is that which has to do with the men who have accomplished that which makes history. As a rule the actors are indifferent to self, indeed, often being unaware of their own importance." This applies strikingly to the great young veteran whom we are honoring tonight. About twenty-five years ago, during a visit in Dallas, Professor Lloyd said to me, "After I am sixty years of age I will only do that I want to do"; meaning thereby, I assumed, he would not be so constantly occupied. These hours of ease, the accomplishment of the period since then, most of us would consider wonderfully productive years of activity.

Charles Dickens said: "It is well for a man to respect his own vocation, whatever it is, and to think himself bound to uphold it, and to claim for it the respect it deserves."

At least seven great achievements characterize pharmacy of the last century and the present one. These are the discovery of important elements by Scheele; analysis and synthesis by Sertuerner; the

*Parts of an Address at a Dinner in Cincinnati in Celebration of the 80th Anniversary of Professor J. U. Lloyd.

discovery of alkaloids by Pelletier, Caventou and other pharmacists; the inauguration of synthetic chemistry by Woehler and Liebig; the beginning of the study of the coal tar products by Unverdorben; the use of ether for anesthesia by the physician-pharmacist, Crawford W. Long, of Georgia; the manufacture of biologicals by various pharmacists, and for implanting the fundamentals of Colloidal Chemistry—our own Dr. John Uri Lloyd.

On the occasion of the visit to Cincinnati of Dr. Wolfgang Ostwald, the foremost exponent of modern colloidal chemistry stated that the studies of mass action made by Professor Lloyd in the 70's and 80's as presented in a series of papers to the American Pharmaceutical Association in many particulars antedated his own work in that phase of colloidal chemistry, foreshadowing many of the discoveries and deductions made by later students. If I am correct in my hasty reading, Professor Lloyd's first presentation of the articles which embody the fundamentals was made to the American Pharmaceutical Association in 1879 answering a query on the conditions necessary to successfully conduct percolation and this was followed by a series of contributions on precipitates in Fluid Extracts.

The thoroughness of these investigations is shown by his wonderful and comprehensive studies of nature's processes. The intense interest of Dr. Ostwald was first made of record in an editorial of *Kolloidchemische Beihefte* and a translation of the early investigators of our distinguished guest of honor. Dr. Sigmund Waldbott translated the editorial preface to the translations of Dr. Ostwald, from which I am taking the liberty of quoting brief extracts.

> "Indeed it is not historical interest that prompted the Editor to induce Professor Lloyd to have his studies republished in the present form. Neither has he been guided by the consideration of the fact that these studies have become known only to a small circle, owing to the limited circulation of the medium of their publication, to members of the Society only.
>
> "The Editor rather takes the ground that in these studies, with truly classic thoroughness and penetrating power of reasoning, 'New Views of Everyday Phenomena' (Charles Darwin) have been discovered and discussed, and they contain so much of what interests us today in our domain of applied Colloidal Chemistry that in many places a direct connection with the questions of the day becomes self-evident.

"To give examples: Even very recently, the question of the cause and effects of turbidity in pharmaceutical tinctures had been spiritedly discussed. As far as the Editor is aware (and he has been interested in phenomena also for other reasons, and has consulted published literature) there is nowhere indicated, including the manuals and pharmacopœias, even approximately, such a complete, thorough and diversified discussion of the factors involved as is contained in the present study of J. U. Lloyd. The discussion of this investigator on this subject, and not less so on the theory of percolation, the interesting experiments on the influence of the dimensions of the percolation, the percolator on the yield, etc., are of such nature that they should be incorporated, partly quoted in full, in the textbooks on the preparation of pharmaceutical substances. . . .

"Furthermore: To the questions of the day in Colloidal Chemistry belong the phenomena of Liesegang's Rings, in general the phenomena of periodical special discontinuities resulting from theoretically continuously progressing reactions in space, as *e. g.,* chemical reactions precipitations, crystallizations, solidifications, etc. In the present study, J. U. Lloyd describes undoubtedly the simplest, and, therefore theoretically the most important, experiment of this kind that has ever been published so far. His references to interesting experiments on capillary analysis are equally forceful."

Dr. Ostwald has continued his studies of the work of Professor Lloyd. He has recently said that modern Physical Chemistry confirms and proves in a beautiful manner the observations Professor Lloyd made many years ago. Referring to a classification of a series of solvents, he said that this corresponds exactly with what the modern theory of liquids would make on a theoretical basis and it again furnishes handsome proof of the exactness of Lloyd's purely experimental work. This calls to my mind a statement of Professor Lloyd some years ago: "Rational experimentation cannot be separated from systematic thought and theories nor can theoretical science separate itself from reactions observed in materialistic directions. No opprobrium should therefore be cast upon the man whose line of activity leads him into unknown fields of experimentation, nor should any touch of satire be cast by such a man upon him who, without experimentation, moves the world onward by his scientific reasons and deductions."

It is a matter of impossibility for me to discuss the subject which would require hours for one thoroughly informed, but I do want to impress upon you the importance of this most valuable research and gain a conception of the sound and remarkable reasoning of the scientist we seek to honor tonight and who really honors us by his presence.

The Headquarters Fund of the American Pharmaceutical Association is making satisfactory progress, and as this comes nearer to realization and completion it is hoped and expected greater interest in its equipment and activities will be taken; so that pharmacists may have pride in their profession and accomplishments in which you will be interested because it is for the service of humanity. Herein we can establish the hall of fame for pharmacists who have done things worth while in the service for their profession so pharmacy may progress and serve humanity better, and this hall of fame would most assuredly be incomplete without due representation of the veteran ex-President of the American Pharmaceutical Association and former official in many other important functions and activities and records of his work and accomplishments. We honor him because he has added to the prestige of pharmacy, because he has contributed largely to its services for humanity; we honor him because he has honored us, because he has labored for us and with us, because he has searched and studied carefully.

We associate his name with all drugs and medicinal products, methods of preparation and standardization. He investigated earnestly and unselfishly, he separated the pure from the crude by his original methods.

We honor him because of his contributions to literature, for his studies of food products, of components of drugs and perfumes; of apparatus and many other things that add to a long list of his activities.

We congratulate him on coming to a period of life—marked by the friendship of thousands and by four score years of most valuable service—in health, and strength. We wish for Mrs. Lloyd and her devoted husband many more years of happiness and health, and rejoice with the children in the grand character of an illustrious father and loving parent.

MEDICAL AND PHARMACEUTICAL NOTES

WARTS AND THEIR TREATMENT—*Common Warts.*—Chemical caustics: Nitric acid to be applied cautiously, a drop or two at a time, the sound skin round each wart to be smeared over with vaseline. In four or seven days the yellow dead tissue to be cut away and the application of acid continued until all the wart is removed. Trichloracetic acid and acid nitrate of mercury may be used in a similar way. Other methods are freezing off with carbon dioxide snow, burning off with the galvano-cautery under novocaine, electrolysis, zinc ionisation, a pastille dose of X-rays unfiltered. *Plane Warts.*—If few in number apply glacial acetic acid or paint every other day with salicylic acid 12 per cent. in collodion; the galvano-cautery at a dull red heat without novocaine sometimes gives good results, but the most satisfactory treatment for a crop of these warts is by X-rays. *Filiform Warts* are best treated by electrolysis, but novocaine and cautery or zinc ionisation can be used. *Digitate Warts,* which are common on the scalp, can be treated similarly to the filiform variety, or with nitric acid or glacial acetic acid; the latter is safer, but not so rapid. *Condylomata Acuminata.*—These are situated on the genitals and are often misnamed venereal or gonorrhœal warts, and are most effectively removed by galvano-cautery under an anesthetic. If small, solid silver nitrate stick is indicated. This is the only kind of wart for which silver nitrate is useful. *Plantar Warts.*—There are only two methods of treating: scraping out under an anesthetic and X-raying or radium. *Seborrhœic* or *Senile Warts,* which are brown or black elevations, are easily removed by freezing with carbon dioxide snow or by painting with pure carbolic acid once or twice as may be required. *Keratoses* form part of the "exoteric developments" known as "sailor's skin" or "senile skin," and can be removed by galvano-cautery, curetting, or carbon dioxide snow. The same treatment is applicable in keratoses in chronic X-ray dermatitis in men who have worked for many years with tar or crude mineral oils, and have taken arsenic over long periods.—A. C. Roxburgh (*Practitioner,* 722, 80, 1928) through *Pharmacy Journal.*

CALCIUM GLUCONATE PRODUCED BY A MOLD GROWTH—The despised mold, popularly considered only destructive, is now used in the making of a health-giving product. This fact is one of those brought to the attention of the public by the U. S. Department of Agriculture at the recent Exposition of Chemical Industries held at Grand Central Palace, New York City.

The process of putting molds to work in producing gluconic acid, used in making an expensive calcium salt with highly important medical qualities, was discovered and recently perfected by Horace T. Herrick and Orville E. May, chemists in the Bureau of Chemistry and Soils of the department. By the new method this salt is reduced in cost from about $150 a pound to 50 cents a pound. "This," says Dr. Henry G. Knight, Chief of the Bureau, "is an example of the manner in which the bureau is using apparently useless organisms to create valuable chemicals.

"The calcium gluconate which is made from the gluconic acid produced in the Color and Farm Wastes Division of the bureau," says Doctor Knight, "is now regarded as the only calcium salt which can be injected between the muscles in the treatment of certain ailments of man without causing abscesses. In common with other calcium salts it can be injected into the blood stream or given through the mouth, and, in contrast to the exceedingly disagreeable taste of other calcium salts, it is practically tasteless.

"Until the investigators discovered the kind of mold that produces gluconic acid, learned to feed this mold the right amount of glucose, learned to keep it in liquid of the right temperature, perfected large containers which would not corrode from the action of the acid and finished other laborious research," says Doctor Knight, "calcium gluconate remained a rare medicine, manufactured by chemical processes and held at exceedingly high prices by certain European manufacturers."

The discoverers of the particular kind of mold—called *Pencillium luteum purpurogenum var rubrisclerotium Thom, No. 2670*—say they were hunting for molds to produce tartaric acid. After examining 149 molds, the hundred and fiftieth unexpectedly produced gluconic acid.

It is also believed that calcium gluconate, when fed to high-production hens which lay thin-shelled eggs, may have a marked and unusual effect in thickening the shells. It is considered possible that the textile and tanning industries will also make use of gluconic acid.

DIURESIS FROM WATER-SOLUBLE BISMUTH—Bismuth Sodium Tartrate in Subjects With and Without Edema.—The diuretic action of the bismuth ion injected in the form of insoluble compounds, or of soluble compounds in oil, is prompt and definite, though fleeting, duration of action being usually not more than twenty-four hours.

A sustained diuretic action is much desired in conditions accompanied by anasarca or edema requiring the use of diuretics. Such action manifests itself with suitable, water-soluble compounds of bismuth, owing to more rapid diffusion and absorption of bismuth, and to absence of encapsulation. The excretion also might be completed sooner, thereby avoiding unnecessary actions of the bismuth on the body.

Bismuth sodium tartrate has been studied along several lines during the last forty-two years, but no one has considered a possible diuretic action of the compound. Its pharmacology was studied by Steinfeld in 1886. Since then, more detailed study has been given to it, including its therapeutic action in experimental syphilis, by G. A. Masson: Jour. Pharmacology and Experimental Therapeutics 30:39 (Nov.) 1926; 30:121 (Dec.) 1926. In this paper its use in syphilis is not discussed by Hanzlik and his co-workers. Their research was its usefulness as a diuretic. And their results seem promising.

Injected intravenously, bismuth sodium tartrate is definitely toxic, the main action being exerted on the circulation and resulting in collapse through injurious effects on the heart. This is of importance in the case of accidental vein injection in connection with its use intramuscularly. According to Masson, the fatal dose in cats is about 4.45 mg (bismuth metal) per kilogram, or about ten times the minimum effective does for circulation. Intramuscularly, however, this compound and other tartrates of bismuth possess a relatively low toxicity.

The bismuth sodium tartrate used by these research workers is said to be a tetrabismuth tartrate and is dispensed as a water-clear solution of 1.5 per cent. strength in a solution of 25 per cent. (hypertonic) of sucrose containing 2 per cent. of benzyl alcohol. Two cubic centimeters, which contains 0.03 of the bismuth compound, was injected intramuscularly as a single dose, or the equivalent of 0.0221 gm. of metallic bismuth.

Deleterious effects on the kidneys, as indicated by tests for albumen in the urine of all subjects and the excretory tests with

phenolsulphonphthalein made in patients were not demonstrable. Of two hundred injections given to twenty patients only one gave a side action; this one suffered an abscess which required surgical evacuation.

Their conclusions are as follows:

1st. Bismuth sodium tartrate, injected intramuscularly in doses of 0.03 gm. caused a prompt and well sustained diuresis in subjects with and without edema.

2nd. This action occurred without demonstrable local or systemic reactions and apparently without injury to renal functional efficiency.

3rd. The diuretic efficiency of bismuth sodium tartrate excelled that of merbaphen (novasurol) and of theophylline sodium acetate in the two subjects in whom these drugs were compared. The advantages of bismuth over these drugs and also over the insoluble and oil-suspended compounds are discussed.

4th. The excretion of bismuth after bismuth sodium tartrate is prompt and more rapid and complete than after the insoluble and oil-suspended bismuth products, this being of practical importance in circumventing possibilities of harm from the stored bismuth of the latter products. (*Jour. A. M. A.*, April 27, 1929, page 1413.)
J. K. Thum.

REPORT OF THE ANNUAL MEETING OF THE PHILADELPHIA COLLEGE OF PHARMACY AND SCIENCE

THE ANNUAL MEETING of the members of the College was called to order at 2.30 P. M., March 25, 1929; President Krusen in the chair. Twenty-nine members were in attendance. The minutes of the semi-annual meeting held Monday, September 24, 1928, were read and approved. Extracts from the minutes of the meetings of the Board of Trustees were read by Mr. Beetem and the actions reported were approved.

Annual reports were presented as follows:

Annual reports were presented as follows:

Curator's Report	By Arno Viehoever
Librarian's Report	By Ada S. Capwell
Editor's Report	By Ivor Griffith
Committee on Publication Report	By Charles H. LaWall
Committee on Necrology Report	By Freeman P. Stroup
President's Report	By President Krusen

All of the foregoing reports were upon motion received and that of the Committee on Publication, which contained recommendations for disbursement of funds, was referred to the Finance Committee.

The other reports referred to were transmitted to the Editor of the AMERICAN JOURNAL OF PHARMACY for publication as read, or in abstract.

Following the reading of the report of the Committee on Necrology, the members present stood in silent tribute to the memory of those who had passed on.

The report of the Nominating Committee, submitted by Chairman Quintus Hoch, included the following nominees for the offices to be filled by election at this meeting.

OFFICERS	TRUSTEES—3 Years
For President—Wilmer Krusen.	(Four to be Elected)
1st Vice-President—Wm. L. Cliffe.	Josiah C. Peacock.
2d Vice-President—C. Mahlon Kline.	Samuel P. Wetherill, Jr.
Treasurer—Milton Campbell.	Frederick B. Kilmer.
Corr. Secretary—Joseph W. England.	W. W. McNeary.
Rec. Secretary—Ambrose Hunsberger.	———
Curator—Arno Viehoever.	George W. Fehr.
Librarian—Ada S. Capwell.	(Unexpired term) Otto Kraus.
Editor—Ivor Griffith.	———
	Fred'k W. Haussmann.
	(Unexpired term) Robt. Shoemaker.

Committee on Publication: Chas. H. LaWall. Joseph W. England. John K. Thum. Arno Viehoever. J. W. Sturmer. E. Fullerton Cook.

In accordance with the wishes of Treasurer Campbell, who expects to be away during a considerable portion of the ensuing year, his nomination for re-election was withdrawn, similar action was taken in the case of Mr. Peacock, who had expressed the desire to be relieved of his duties as a member of the Board of Trustees on account of other pressing affairs.

The Chair thereupon invited further nominations from the floor and the following names were presented:

O. W. Osterlund for Treasurer:
Milton Campbell to take Mr. Osterlund's place as Trustee;
Philip Johnson to take Mr. Peacock's place as Trustee.

Upon motion, nominations were closed. There being no opposition, it was moved that Mr. Hoch be instructed to cast a ballot to elect the list of nominees, as revised, to the respective offices. The motion was carried unanimously and Mr. Hoch cast a ballot in favor of the following names:

OFFICERS.

For President—Wilmer Krusen.
1st Vice-President—Wm. L. Cliffe.
2d Vice-President—C. Mahlon Kline.
Treasurer—Otto W. Osterlund.
Corr. Secretary—Joseph W. England.
Rec. Secretary—Ambrose Hunsberger.
Curator—Arno Viehoever.
Librarian—Ada S. Capwell.
Editor—Ivor Griffith.

TRUSTEES—3 Years
(Four to be Elected)

Philip Johnson.
Samuel P. Wetherill, Jr.
Frederick B. Kilmer.
W. W. McNeary.

George W. Fehr.
(Unexpired term) Otto Kraus.

Fred'k W. Haussmann.
(Unexpired term) Robt. Shoemaker.
Milton Campbell.
(Unexpired term) O. W. Osterlund.

Committee on Publication:
Chas. H. LaWall.
Joseph W. England.
John K. Thum.
Arno Viehoever.
J. W. Sturmer.
E. Fullerton Cook.

Following the casting of the ballot by Mr. Hoch, the Chair declared those named elected for the ensuing year to the respective offices.

Dr. F. E. Stewart announced his desire to contribute certain books to the College library. The offer was thankfully received and referred to the Committees on Library and Publication.

Mr. Cliffe reported a gift of $1000 from the N. J. Alumni of the College, the money to be used to a definite purpose, which is to be set forth by the Board of Trustees. Mr. Cliffe announced also that the Class of 1884 is ready to donate the sum of $500 to be used as a prize award in honor of Frank G. Ryan, one of the members of the class.

The newly elected trustees, Messrs. Haussman and Fehr, expressed appreciation of the honor and pledged their best efforts in behalf of the College.

DETERMINATION OF UNSAPONIFIABLE MATTER IN FISH OILS—Recently the writer was required to analyze a number of fish oil samples for unsaponifiable matter employing the U. S. P. technique. The first few samples formed an emulsion which was difficult to break. In one instance it was necessary to discard the emulsified sample and repeat the test.

This led to an investigation of the source of the trouble. After some study it was decided to be due to faulty technique and the emulsion could be avoided, if a certain routine was followed. To those who are interested in determining the unsaponifiable matter in fish oils such as cod liver, shark, whale, menhaden, etc., the following method is suggested.

Method: Weigh 5 grams of fish oil into a 100 cc. flask, add 5 cc. of a 50 per cent potassium hydrate solution and then 50 cc. of 95 per cent. alcohol, boil under a reflux condenser for one hour or until the oil is completely saponified. Remove the reflux condenser and allow the alcohol to evaporate until the soap is dry. Care must be taken not to burn the soap. Dissolve the soap in 50 cc. of hot distilled water making sure there are no lumps present and the soap is in perfectly clear solution. Transfer the clear soap solution with 50 cc. of boiling distilled water into a 250 cc. glass stoppered cylinder which has had about 5 cc. of hot water previously placed in it, so that the soap solution does not stick to the bottom. The flask is then washed out with two portions of 5 cc. of 95 per cent. alcohol and the alcohol added to the soap solution in the cylinder. Mix the soap solution by slowly rotating the cylinder and cool by placing the cylinder either in ice water or under the cold water tap. When the soap solution is perfectly cold add 50 cc. of ether, shake very lightly and allow to stand. At this time 40 cc. of ether might settle out instead of 50 cc. If there is not a break add 10 cc. of 95 per cent. alcohol. Do not shake. Siphon over the ether solution into a separatory funnel, add another 50 cc. of ether, shake vigorously and allow to stand. If there is not a break add 1 cc. of cold distilled water, slowly rotate the cylinder and let it stand for a few minutes. Then add 2 cc. of 95 per cent. alcohol; do not shake. Siphon over the ether and again add two separate portions of 25 cc. each of ether to the soap solution, shake and permit to settle, repeating the process. Wash the ether solution in separatory funnel with about 50 cc. of

cold distilled water by rotating the mixture slowly so as not to form an emulsion. Continue the washing seven or eight times, then wash until the water shows no red color with phenolphthalein. Transfer the ether solution to a weighed beaker, allow the ether to evaporate to dryness on a steam bath, dry in an oven at 105° C. for 15 minutes, cool and weigh, repeating until weight is constant.

WALLACE H. DICKHART.

NEWS ITEMS AND PERSONAL NOTES

ECONOMIC CONFERENCE WELL ATTENDED—An economic conference, sponsored by the Philadelphia College of Pharmacy and Science; Temple University College of Pharmacy, Philadelphia Association of Retail Druggists, and Camden County, N. J., Retail Druggists' Association, was held on May 2, at the Philadelphia College of Pharmacy. It was attended by hundreds of druggists from Philadelphia and neighboring towns.

Dr. Herbert W. Hess, Professor of Commerce, Wharton School, University of Pennsylvania, discussed the chain drug store. He stated that the success of the chain depends upon greater efficiency through organization—which implies lower prices—a large experimental research department and mass buying.

R. W. Lyons. executive secretary of the National Chain Store Association, discussed "The Business Principles Underlying Chain Store Development."

Robert S. Sherwin, of Newark, N. J., spoke on the prescription department and laboratory as defensive measures against the chain store. Harry S. Noel, of the Druggists' Research Bureau, described the aid offered the independent druggist by the bureau.

John T. Woodside, of Chicago, was the principal speaker at the evening session.

PHARMACY HEADQUATERS BUILDING NEWS—The American Pharmaceutical Association is pleased to announce the election by the Council—upon the recommendation of the Committee on Plans—of Mr. John Russel Pope of New York City as the architect

for the Headquarters Building and that Mr. Pope has accepted the commission with an expression of enthusiastic interest in the opportunity to co-operate with the pharmacists of the country in developing the unique institution to be erected on the commanding site purchased last year on The Mall in Washington. This site is directly opposite the Lincoln Memorial, adjoins the property of the National Academy of Sciences and the Public Health Service and commands a view of the Washington Monument, the Lincoln Memorial, the Arlington Memorial Bridge, and the Potomac River.

Preliminary designs and sketches of the building and grounds have been prepared and have been approved by the Commission of Fine Arts. The Committee on Plans, of the Association, will proceed to work out the details and arrangement of space so as to accommodate the various activities to be housed in the building. It is hoped to have the final plans completed for submission at the annual meeting of the Association in Rapid City, South Dakota, in August and to begin the construction of the building early in 1930.

HANBURY MEDAL AWARDED TO DR. HENRY HURD RUSBY OF NEW YORK—News dispatches from London announce the award of the Hanbury gold medal for 1928 to Dr. Henry Hurd Rusby, dean of the New York College of Pharmacy, Columbia University, "for high excellence in the prosecution or promotion of original research in the natural history and chemistry of drugs." The adjudicating committee consisted of Sir Sidney F. Harmor, president of the Linnean Society; Professor J. F. Thorpe, president of the Chemical Society; H. Skinner, president of the Pharmaceutical Society of Great Britain; R. R. Bennett, and A. R. Melhuish. According to the dispatch it was understood that Dr. Rusby would go to London in October to receive the award.

The Hanbury Medal of the British Pharmaceutical Society, which is awarded biennially for original research in the chemistry and natural history of drugs, has been presented to a notable list of men distinguished for original investigations pertaining to the subjects of pharmacognosy and materia medica as may come within the scope of the award. Dr. Rusby will be the third American to receive the Hanbury medal, the first recipient being the late Professor John M. Maisch, of Philadelphia, upon whom it was conferred in 1893, when

he was on his deathbed. The second American recipient was the late Dr. Frederick B. Power, who was awarded the medal in 1913, and who died in March, 1927. Dr. Power was for many years director of the school of pharmacy of Wisconsin University, then director of the Wellcome Research Laboratories in London until 1916, when he returned to the United States and served as head of the phytochemical laboratory of the Bureau of Chemistry until his death.

(*Pharm. Era*)

FRANK R. ROHRMAN, DECEASED—Frank Randall Rohrman, 67, president and general manager of the Philadelphia Wholesale Drug Company, oldest and one of the largest co-operative wholesale drug concerns in the country, died suddenly on May 6, while on his way from his offices at Tenth and Spring Garden Streets to the Manufacturers' Club, Broad and Walnut Streets, Philadelphia. Death was due to heart failure, physicians stated.

Mr. Rohrman was a leading member of the Wholesale Druggists' Association, and took an active part in helping to develop co-operative jobbing houses other than his own. He was born in Philadelphia May 4, 1862, and was graduated from the Philadelphia College of Pharmacy in 1883, an institution which he later served for five years as vice-president. In 1879 he started working in the wholesale house of Robert Shoemaker & Co., of Philadelphia, where he remained four years. In 1883, he went to Baltimore where he was engaged in the retail drug business for nine years. Returning to Philadelphia in 1892, he became manager of the Philadelphia Wholesale Drug Co., then known as the Apothecaries Union, Limited, and its actual head, and since 1911, its president and general manager.

Only recently the company which he so well managed moved into its new buildings at Tenth and Spring Garden Streets, owned and built by the members of the company, a structure which bespeaks the success and faith of Mr. Rohrman and his associates in co-operative jobbing.

Mr. Rohrman was a member of the Manufacturers' and other Philadelphia clubs, and resided at 601 East Gorgas St., Mt. Airy. The funeral exercises were held on May 8, the burial following in West Laurel Hill Cemetery.

BOOK REVIEWS

ALLEN'S COMMERCIAL ORGANIC ANALYSIS. Edited by C. Ainsworth Mitchell, with special contributors. Volume VII, The Vegetable Alkaloids, fifth edition, revised and partly rewritten. xi-869 pages, illustrations, 8vo. Philadelphia, P. Blakiston's Son & Company, 1929. Price, $7.50.

The first issue (1879) of Alfred H. Allen's "Commercial Organic Analysis" was a most welcome addition to the reference literature available to English-speaking chemists. In those days Germany was carrying on almost all the creative work in organic chemistry and the increasing uses of artificial colors and other synthetics were bringing important and difficult problems into the laboratory. The book was by Mr. Allen alone. The data furnished by French and German journals were largely utilized through abstracts in British journals, for the author had but limited acquaintance with foreign languages, a lack much too common among English-speaking chemists in those days.

The first edition was in two volumes, containing a large amount of new information, yet showed some evidence of haste in preparation, as was to be expected. It, however, assumd at once the dominant position in applied analytical chemistry which it deserved and has maintained. It has undergone much modification. The author's health failed somewhat, comparatively early in life, and he conducted a large analytic business which, of course, interferred with keeping the book up to date. For a time he maintained an office (principally for consultation) in London, but a journey several times a week from Sheffield, almost two hundred miles, proved inadvisable. The work went into a second edition, but later when this was exhausted, a pirated American edition, a mere reprint of the out-of-print one, was published it became advisable to make some effort for revision through an assistant. The present reviewer was chosen to undertake the work, and an edition with much new matter promptly appeared. This was the beginning of the "Anglo-American" Allen, which has been conspicuous in commercial organic analysis for many years.

The present volume brings the book back practically to its original home, for of eleven contributors only one is an American. He is Mr. Frank O. Taylor, of Detroit, associated with Parke, Davis and Company. The British editor has seen fit to designate him only as of the U. S. A.

The volume is devoted to the "Alkaloids" and is a comprehensive up-to-date presentation of the data concerning this important group of compounds. The toxicology of them is fully treated, and many interesting details concerning sources, properties and structural relations are given. It is gratifying to note that work done a couple of years ago by Howard and Stephenson in Washington relating to the crystal forms of alkaloids is duly noted. The article on opium, by Taylor, gives a large amount of information.

The volume maintains the high character that the work has always possessed, and will be welcome to a large number of chemists, especially those engaged in drug control or toxicologic investigations.

HENRY LEFFMANN.

PHARMACEUTICAL THERAPEUTICS WITH PHARMACOLOGY, POSOLOGY AND TOXICOLOGY, by Eldin V. Lynn, Ph. D., First Edition, McGraw-Hill Book Company, Inc., New York, 1929. Price $4.00. (Reviewed by Dr. H. C. Wood, Jr.)

It is rather remarkable that there is such a paucity of books on pharmacology and therapeutics from the standpoint of the druggist. There are plenty of texts, good, bad and indifferent, on Materia Medica written from the viewpoint of the pharmacognocist or botanist, some of which make brief, but usually worthless, reference to the therapeutic properties of the drugs. There are a still larger number of ponderous tomes dealing of physiological action and details of clinical uses, valuable to the student or practitioner of medicine, but this is the first textbook that we have reviewed, intended for students of pharmacy, that gives the modern viewpoint of drug therapy as based upon scientific knowledge of drug action. We agree with the author of this book that the druggist should not be encouraged to consider himself competent to prescribe, and it is not necessary, therefore, that he should have a detailed knowledge of the therapeutic uses of the medicaments he dispenses, but he should have

some general information concerning their physiological and therapeutic properties, and that this information should be based on the most modern of pharmacologic knowledge, not on the empiricism of past generations.

Doctor Lynn has adopted a useful classification based on the predominating pharmacologic action of the drugs, and while here and there are a few statements to which exceptions may be taken, such as—that chloral is the most frequently prescribed hypnotic except morphine; or that the convulsions of strychnine poisoning "are not dangerous in themselves"—on the whole the book reflects, with a creditable degree of accuracy, the present status of pharmacologic therapeutics.

There is practically no mention of anything of a pharmacognostic nature, or of the physical properties of drugs, and rather scanty consideration of their chemical qualities, such as the nature of their active principles. For example, we believe it would have encouraged a better apprehension of the relation between cascara, aloe and senna if there were some explanation of the chemical relationship of the various anthro-quinone derivatives. In our opinion, the book would have been improved, for the undergraduate student at least, if there had been included a little more of this sort of material.

The typography is rather unfortunate, especially for college work. The same type is used for drugs found in the U. S. P., N. F., N. R., and B. P., as well as for crude drugs and preparations. To the pharmacist who has been out of school for some years, we would heartily recommend the study of this book as calculated to give him an entirely new viewpoint of drug action.

HORATIO C. WOOD.

RECIPE BOOK. American Pharmaceutical Association.

The long-heralded Recipe Book of the American Pharmaceutical Association is at last available. For a great many years various workers have contributed their efforts in the compilation of the valuable collection of formulas and finally these recipes have been gathered together, classified, standardized and tested as to workability and reliability—and now comes the finished book, a well printed, durably bound "blue-book" of practical formulas.

Originally suggested by Dr. Henry P. Hynson, of Baltimore, as an unofficial formulary for the practicing druggist, and as a resting

place for the formulas of those preparations, still useful and used, yet dismissed from the official books—the book in its preparation has passed through many hands, and in its present state it stands, no doubt, as the most complete and systematic book of its kind available.

Although the edition now available is the first, the Recipe Book is quite worthy of the association that sponsors it.

Possibly a brief review of its contents will reflect the scope and character of the book. Each formula is accurately given—in the manner of the National Formulary—and working directions are given for every separate item. The arrangement in each department is alphabetical—based on the English title—ampuls, balsam, cataplasms, etc., in the pharmaceutical section, following in sequence.

The general make-up of the book so far as formulas are concerned is as follows:

	Separate Items
Pharmaceutical	777
Technical	69
Cosmetics	184
Diagnostic Reagents and Clinical Tests	66
Photographic	45
Dental	34
Veterinary	28
Flavoring Extracts	45
Hospital	375
	1,623

It was deemed wise to separate the hospital formulas from the bulk of pharmaceutical formulas. Hospital pharmacists will find the book indispensable and every practicing pharmacist should find it a most useful laboratory adjunct.

No longer need Druggist Brown be thinking that Benedict Solution is like benedictine, a cocktail ingredient, or that Mittendorf's spirit is an eye opener (which it really is—"Spirit Ophthalmicus Mittendorfii"). Such formulas he will have at hand for here is a book that represents an effort to compile all the practical and the called-for pharmaceutical and near-pharmaceutical recipes.

Nor does the book bear the inflexible mark of the official books, upon its contents—for the formulas here permit elaboration—and possibly improvement at the hand of the intelligent operator.

The technical and cosmetic department is quite up to date, and it is not an idle boast to state that there may be found formulas which have never appeared elsewhere.

For pharmacists everywhere—in retail stores—in pharmaceutical manufactories—in clinical and chemical laboratories—in the hospital pharmacy—everywhere that pharmacy is practiced this book is *bound* to be invaluable.

The price of the book is $5.00. All told, it has 454 pages, 50 of which comprise a most complete index. It may be purchased from J. B. Lippincott Company, 227 South Sixth Street, Philadelphia, or from the American Pharmaceutical Association, 10 West Chase Street, Baltimore, Md., or through such agencies that have previously supplied the National Formulary and the Pharmacopoeia.